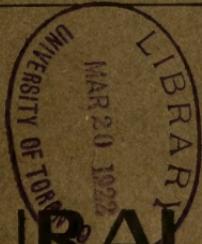


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THE AGRICULTURAL GAZETTE OF CANADA



Vol. IX

March-April, 1922

No. 2

LEADING TOPICS

Corn: Its History, Production and Utilization

The Prince Edward Island Experimental Station

The Reindeer Industry

New Varieties of Apples

Nine Years of Agricultural Instruction in Quebec

Summer Fallow Substitutes

The School in the Rural Community

The School Exhibition, When and Where

Agricultural Statistics

The World's Live Stock

STORAGE

DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

The Agricultural Gazette of Canada is published bi-monthly, in English and in French, by the Dominion Department of Agriculture, Ottawa.

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The Agricultural Gazette is not intended for general distribution. It is sent free to agricultural workers and teachers, including school teachers who have agricultural teaching qualifications; to members of parliament; to libraries; to the Press, and, as an exchange, to institutions in other parts of the Empire and in foreign countries.

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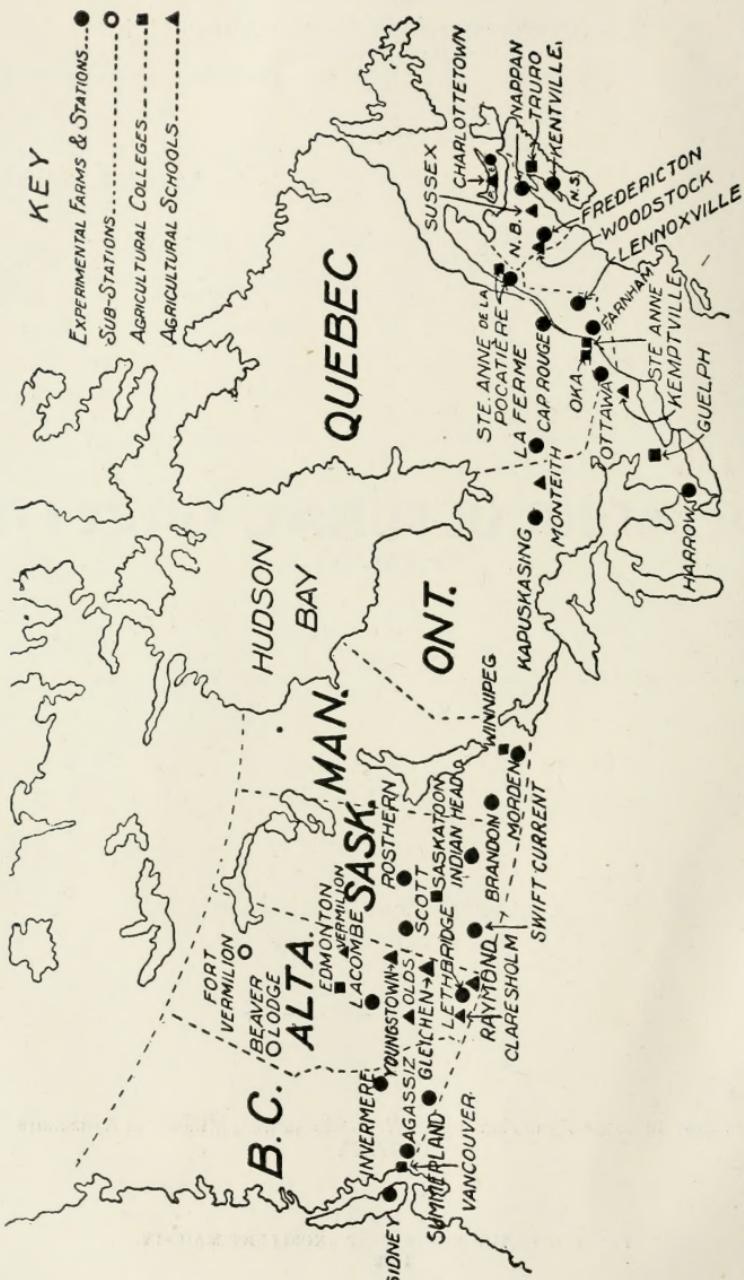
**The AGRICULTURAL GAZETTE
OF CANADA**

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

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OTTAWA

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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1922

○ SWEDE CREEK



MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

CONTENTS

PART I.

DOMINION DEPARTMENT OF AGRICULTURE

	PAGE
CORN: ITS HISTORY, PRODUCTION AND UTILIZATION—THE EUROPEAN CORN BORER, by J. H. Grisdale, D.A.Sc., Deputy Minister of Agriculture for Canada.....	83
THE DOMINION EXPERIMENTAL FARMS—THE PRINCE EDWARD ISLAND EXPERIMENTAL STATION, by J. A. Clark, B.S.A., Superintendent.....	87
THE REINDEER INDUSTRY, by E. A. Watson, Capt. C.A.V.C., Chief Animal Pathologist, Health of Animals Branch.....	93
NEW VARIETIES OF APPLES ORIGINATED AT THE CENTRAL EXPERIMENTAL FARM, by W. T. Macoun, Dominion Horticulturist.....	96
THE DOMINION EDUCATIONAL BUTTER SCORING CONTEST, 1921—FINAL RESULTS, by Geo. H. Barr, Chief, Dairy Division.....	99

PART II.

PROVINCIAL DEPARTMENT OF AGRICULTURE

NINE YEARS OF AGRICULTURAL INSTRUCTION WORK IN QUEBEC.....	101
NEW YEARS OF AGRICULTURAL INSTRUCTION WORK IN MACDONALD COLLEGE.....	108
SUMMER FALLOW SUBSTITUTES—GROWING GRAIN IN ROWS—by Manley Champlin, M.S., Sr. Professor of Field Husbandry, University of Saskatchewan.....	115
WHEY BUTTER, By H. H. Dean, B.S.A., Professor of Dairying, Ontario Agricultural College.....	120
PROGRESS OF SEED POTATO CERTIFICATION IN BRITISH COLUMBIA, by C. Tice, Officer in Charge.....	122

PART III.

AGRICULTURAL EDUCATION AND RELATED ACTIVITIES

AGRICULTURAL EDUCATION IN ONTARIO, by Dr. J. B. Dandeno, Inspector of Agricultural Classes.....	126
THE SCHOOL IN THE RURAL COMMUNITY—CONCLUDED, by G. V. Van Tausk, M.A., B.Sc. (Oxon), B.S.A.....	127
THE SCHOOL EXHIBITION—WHEN AND WHERE, by J. W. Gibson, British Columbia; Dr. J. B. Dandeno, Ontario; S. T. Newton, Manitoba; F. W. Bates, B.A., M.Sc., Saskatchewan; L. A. DeWolfe, B.A., M.Sc., Nova Scotia; A. C. Gorham, M.Sc., New Brunswick.....	132

PART IV.

SPECIAL CONTRIBUTIONS, REPORTS OF AGRICULTURAL ORGANIZATIONS, PUBLICATIONS AND NOTES

RURAL CREDIT SYSTEMS, ONTARIO, by A. G. Farrow, Chairman Agricultural Development Board.....	141
ANNUAL AGRICULTURAL STATISTICS OF CANADA, by Ernest H. Godfrey, F.S.S., Dominion Bureau of Statistics.....	145
AGRICULTURAL PRODUCTION OF CANADA, in 1921, by Ernest H. Godfrey, F.S.S.....	148
ROYAL AGRICULTURAL WINEER FAIR ASSOCIATION OF CANADA, by C. F. Bailey, Managing Director	152
NEWS ITEMS AND NOTES.....	154
ASSOCIATIONS AND SOCIETIES.....	156
APPOINTMENTS AND STAFF CHANGES.....	159
THE LIBRARY.....	160
NEW PUBLICATIONS.....	163

PART V.

THE INTERNATIONAL INSTITUTE OF AGRICULTURE

FOREIGN AGRICULTURAL INTELLIGENCE—	
CROPS AND CULTIVATION.....	165
LIVE STOCK AND BREEDING.....	172
RURAL ECONOMICS.....	172
AGRICULTURAL INDUSTRY.....	173
PLANT DISEASES.....	173
THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS.....	176
AGRICULTURAL STATISTICS.....	177

The AGRICULTURAL GAZETTE OF CANADA

VOL. IX

MARCH-APRIL, 1922

No. 2

CORN: ITS HISTORY, PRODUCTION AND UTILIZATION—THE EUROPEAN CORN BORER

BY J. H. GRISDALE, B. AGR., D. A. Sc., DEPUTY MINISTER OF AGRICULTURE FOR CANADA

WHEN about 300 years ago the first European settlers arrived in the American Continent they brought with them seed of wheat, oats, barley and peas—the principal cereals grown in Europe at that time. Since then, wheat, the great bread crop, has been continuously produced on this Continent, and is now exported in greater quantities from this Continent than from any other part of the world. The United States has been known to produce over a billion bushels in a year and Canada's production has reached as high as a 400-million bushel mark. The production of oats, likewise, has reached astonishing proportions, the United States producing as high as 1½ billion bushels and Canada over half a billion. Barley and peas also have made a great mark, particularly barley, but none of these compare in quantity produced with the enormous production of a cereal found growing by the discoverer of this Continent some 425 years ago when first he landed here, namely Indian Corn or Maize.

The corn crop of all America together has in one year been known to surpass the startling figure of three billion bushels, or probably more than all other cereals put together.

As suggested, the corn crop is one that has long been cultivated in this country; as proof, Columbus in his report to Isabella, Queen of Spain, after his first voyage of discovery in 1498, stated that he had seen growing on this continent fields of corn eighteen miles long. Cartier, a few years later, in 1535, describes the Indian Village of Hochelaga (where Montreal now stands) as being surrounded by large fields of growing corn at the time of his visit. In 1685 the English, in connection with one of their wars with the Seneca Indians, claimed to have destroyed about 1,200,000 acres of corn in what is now the State of New York, and Frontenac in 1690 spent several days destroying corn in the same State in connection with his trouble with the Onondaga Indians. Other early explorers in the western parts of the United States and Canada, such as De Soto and Lasalle, make mention of large fields of corn. Thus, we have ample proof that corn was the great staple of the Indians long before the white man reached the shores of this continent.

European settlers early learned the use of this cereal from the Indians and, with them as with the Indians, it soon became the staple crop. Certain of the Commanders bringing over groups of colonists to the United States, gave them small areas of land on condition that they plant it with corn, showing the high esteem in which this crop was held by those responsible for the early development of this continent.

Corn, as just stated, was the great staple of the Indians; in fact, their whole life centered around it. The Indians venerated it and there were Corn Priests, Corn Directors, Corn Guardians and various other functionaries in connection with the production of the crop.

Their methods of cultivation, selection, seed testing, etc., astonishing to say differed but little from those of the present day. In cultural methods they did not, as do we, follow a rotation, but grew corn year after year on the same land until the field played out, when they changed to another field. They grew the corn in hills for the most part, planting usually seven seeds in the hill. They were careful to select the seed, choosing the ears with long straight rows of even kernels, and usually discarded the butt ends and tips. In many cases they tested the seed before planting, by allowing it to germinate either in small heaps or wrapped in what might have been called "the rag-doll" of that day—a layer of nettle leaves over which the seed was strewn thickly, loosely rolled up, tied with thongs and thoroughly wet and kept warm until the seed germinated, when the seed was planted, any not germinating or showing swollen germs being rejected.

The types grown then were, as they are to-day, the Flint and the Dent. The Indian used corn for human consumption only, of course, and the two types grown were used for different purposes: the Flint for making hominy and similar foods; the Dent for the production of flour. They, like ourselves, too, seemed to enjoy the roasted ear. In fact, the roasting of the corn was often celebrated as a feast, large quantities being husked and, after a pit had been excavated and a large quantity of brush and such material burned in it for some time, thus heating it to a high temperature, the corn was laid in it protected by layers of husks and covered over, left for 24 hours, then uncovered and the feast began.

As already suggested, the crop of corn in this country is enormous. The United States crop alone runs from two and a half to nearly three billion bushels of grain and from thirty-five to over forty million tons of ensilage or forage, the most of this latter crop being stored in about a half-million silos. For instance, New York State alone is supposed to have over 60,000 silos and another state, Wisconsin, has somewhere about the same number.

Canada's crop is astonishing when we think of the latitude of this country, namely, something over 15 million bushels of which Ontario alone produces about 13 million bushels.

In addition to the crop for grain, Canada produces about 6 million tons of corn for forage. Of this about 4½ million tons are produced in Ontario. It is estimated that this forage crop is housed in about 40,000 silos in the case of Ontario, with 14 or 15 thousand outside of that province. Outside of hay, silage is certainly the most important forage crop grown in this wide Dominion.

Corn for Silage

The production of corn for silage purposes is a somewhat different matter from production for seed or grain purposes and the cultural treatment of the soil somewhat different. At Ottawa we find that we secure best results when we spread the manure broadcast in the fall, winter and spring or, in other words, as it is made. This would, of course, be influenced somewhat by the topography of the farm, but on land not subject to inundation or serious washing, I believe this is the best method for applying manure. The manure is applied at from 12 to 20 tons per acre according to the supply. The ploughing is not done until as short a time before seeding as practicable, and the moment the land is ploughed it is rolled or packed then disked and well worked down, and seeding done as soon after ploughing as possible in rows $3\frac{1}{2}$ feet apart. It is

then thinned by cross harrowing or, if on account of weather conditions this is not practicable, by means of a hoe so that the average stand does not exceed about one plant every eight or nine inches. The double horse cultivator is commonly used until the plants become so big as to be injured by straddling; then the single horse until the horse and man are no longer visible in the field. The corn is cut when in the late dough stage; is run through the cut-box and cut into as short pieces as possible, as the finer it is the better it will keep and the better will be the flavour. The varieties we find most satisfactory are, Wisconsin No. 7, Golden Glow and Early Leaming, but possibly some large varieties might be more satisfactory in western Ontario. I have seen at least one most extraordinary field of Eureka growing at London.

At the Experimental Farm at Ottawa, the average cost to produce corn for the past four years has been \$57.62 per acre or \$3.52 per ton with an average yield of 16.4 ton per acre. A tabulated statement of the cost and returns would be as follows:—

Average for 4 years—1917, 1918, 1919 and 1920

Rent of land	\$ 8 22*
Manure	7 65†
Seed	1 97
Machinery	3 69
Twine	77
Manual labour (40c. per hr.) . . .	24 75
Horse labour	10 56
Cost per acre	57 62
Yield per acre	16.40 tons
Cost per ton	\$ 3 52
Value per acre	91 84
Profit per acre	34 21

* Land value \$1.25 per acre.

† One-half value of manure.

(Variety mostly used, Wisconsin No. 7.)

The value per acre is figured on the selling price of hay which, in the average of four years, made the ensilage worth \$5.61 per ton.

The advantages of growing corn for ensilage in Canada are many, summarized briefly as follows:—

1. It is an exceedingly cheap feed since, over a period of 20 years, costs have run from \$1.50 to \$3.92 per ton when labour and supplies were most expensive.
2. Large returns per acre. The average crop in this period of time has been equal to about 5 tons of clover hay per acre.
3. Best crop on which to apply manure.
4. Best crop to use when breaking up a sod field.
5. Best crop for cleaning land.
6. Easiest crop to harvest as to weather conditions.
7. The crop most cheaply housed.
8. The crop most easily handled in feeding.
9. Best crop for supplementing dry pastures.
10. Best crop to help induce cattle to consume coarse and poor roughage.
11. Cheapest and best succulent food that can be grown in the provinces of Ontario and Quebec.
12. The crop that permits of the carrying of most live stock per acre.

In short, in Canada as in the United States, it is the stockman's crop par excellence, and now, in Canada as in the United States, this crop is greatly endangered by the appearance of a new pest; in fact, by the appearance of about the only pest that has been of any considerable menace to the crop since the white man started growing it on such an extensive scale on this continent. I refer to the European Corn Borer, which was discovered in Ontario in 1920, and to this pest I think the attention of every farmer in this eastern part of Canada should be drawn and his most intelligent co-operation in the attempts at control be asked.

European Corn Borer

First discovered on this continent in the vicinity of Boston, Mass., in summer of 1917. Found in Canada for the first time in Humberstone township, Wel-

land county, Ont., on August 10, 1920, by officers of the Entomological Branch. Between that date and the end of October, 1920, the pest was located in five townships in Welland and Haldimand counties and in thirty townships in the counties of Elgin, Kent, Middlesex, Huron and Oxford, a total of 2,780 square miles being infested.

The survey conducted by our officers in 1921 indicated that the corn borer is now present in sixty-five additional townships in the counties of Ontario, Lincoln, Welland, Haldimand, Wentworth, Wellington, Waterloo, Brant, Norfolk, Oxford, Perth, Huron, Middlesex, Lambton, Kent and Essex, the total infested area comprising 7,680 square miles, an alarming increase of 4,900 square miles in 1921. In all, 100 townships are now infested. The area with St. Thomas as a centre is the most heavily infested district; some fields of corn in 1921 being estimated to contain as many as 269,000 borers to the acre.

Every part of the corn plant except the smaller roots is attacked by the borer. In badly infested fields a total loss takes place, the work of the borer causing the plants to fall down completely. The insect passes the winter in the caterpillar stage in burrows, in corn stalks, corn refuse, etc.

The infestation in Ontario is recognized as the worst infestation under field

conditions in North America. Naturally, therefore, the United States Department of Agriculture is deeply concerned in the probability of the borer spreading westward to the great corn belt of the Mississippi Valley; and in view of this, an embargo has been placed on the province of Ontario which prohibits the importation of corn plants or corn on the cob and restricts the importation of certain cut flowers and vegetables likely to harbour the borer.

It is now recognized by all entomologists that the extermination of the insect is impossible. The Entomological Branch is doing everything it possibly can to prevent the spread of the insect by quarantining infested townships to prevent the movement of possibly infested plants, by the publication of timely articles, by visiting farmers in the worst infested districts, etc. Within the most heavily infested district we have established a research laboratory which is investigating the biology of the insect and using the information gained therefrom to further control measures. It is going to be a big fight, but we feel that if the farmers will adopt the control measures we recommend, Crop Protection Leaflet No. 16 *The Control of the European Corn Borer*, the insect will be kept within reasonable bounds and not interfere too seriously with the growing of corn. Our entomologists are in close touch with similar officials in the United States.

THE DOMINION EXPERIMENTAL FARMS THE PRINCE EDWARD ISLAND EXPERIMENTAL STATION

BY J. A. CLARK, B. S. A., SUPERINTENDENT

The accompanying article is the second of the Dominion Experimental Farms Series. It narrates in an interesting manner the work carried on at the Prince Edward Island Experimental Station, Charlottetown, and clearly indicates that the results have been of the utmost value to the farmers of "The Island Province."—*Editor.*

THE Experimental Station for this province as established at Charlottetown, Prince Edward Island, in August, 1909, had an area of 29 acres. This has been added to by purchase and lease, so that 150 acres are now available for experiment, research and investigational work. The original area "Ravenwood" was purchased by the Prince Edward Island government and leased to the Federal government on a long term lease for the above purposes. The Station farm is situated about one mile northeast of the business section of the city of Charlottetown, and along either side of the Prince Edward Island Railway. Its location adds much to the usefulness of the Station. The land on the east of the track has a general slope to the west, enabling travellers to see most of the farm crops throughout the season. From the Station buildings the land slopes away on all sides except on the north. Towards the railway on the west the hill is quite steep.

The soil is a dull red colour formed from the red sandstone (Triassic) that underlies the Province. In general it is a sandy loam underlaid with a hardpan of brick clay. The subsoil over a large area of the farm is so impervious to water that it was necessary to underdrain both the low areas and several sections of the higher land to fit them for uniform experimental work. Many different types of soil are represented. These range from almost pure

sand to heavy clay, with swamp areas of pure peat which have been reclaimed by drainage.

The Station is the Island farmer's headquarters for investigational and research work with pests, fertilizers, soils, crops, stock, and for information concerning the many hundred subdivisions which the problems connected with these divide themselves into. The farm problems of to-day increase in complexity. New conditions in regard to labour, machinery, transportation, and markets crowd in upon the farmer. He finds that to work out the solution of many of these problems alone is beyond his means and ability. Every farmer knows that in his occupation we have only just touched the fringe of the possibilities that lie on every hand. He knows that the balance between success and failure, between profit and loss, is often so close that only the touch of experienced advice is necessary to turn the balance in his favour. The Experimental Farm has won the confidence of those who use it. The number of these has steadily increased. This article is written to let the other few thousand farmers in the Province know of the work that is carried on for them, and we trust that we may soon have the privilege of serving them all. The Experimental Farm is a practical demonstration in co-operation. It has its place along with the great cooperative movements that have so great-

ly improved the quality of the finished products of the farm. All Canada, represented by the Government, carries on experiments at the Station to determine ways and means of improving farm practice, methods, stock and crops. The co-operative organizations then standardize, increase and insure the necessary volume to supply the ever increasing demand created.

The work carried on by the Station is naturally so varied in character and so diversified in its objects that it is difficult to present the situation in such a

instruction throughout the province as opportunity offers.

An Improved Barley Originated

Perhaps the most important investigational work was that which resulted in the origination of Charlottetown No. 80 barley. The original work with this grain was begun in 1912, and it was registered under the C. S. G. A. No. E-8596, in April, 1916. This barley has averaged about 8 bushels more per acre than the average of the 8 next best sorts at this Station for the last 9 years. It has practically replaced other sorts in



Cereal Test Plots: Prince Edward Island Experimental Station.

manner as to show the total results in the form of money. Many of the activities, during the past thirteen years, have led directly or indirectly to the financial benefit of the majority of the farmers of the province. It is possible, in some lines, to make a fairly close estimate. In others, the results are in one case so far reaching, and in another so successful, that it is impossible to demonstrate their value in figures.

The work may be divided roughly into investigation and research, demonstration of methods, assistance and actual

the province. It drops most of its awns in the fields, and is spoken of locally as a "farmer's barley." A conservative estimate would be that this superior sort has added 25,000 bushels more barley to the output of grain on the farms of the province. At \$1.50 per bushel, this would be \$37,000 per annum. Wherever this barley has been tested in other provinces, it has already demonstrated its superiority over most others, and its general use would probably add many million bushels to the barley crop of Canada.

Field Crop Investigation

Two series of experimental investigations have been conducted, in co-operation with a number of farmers in different districts of the province to determine the variety of oats best suited to Prince Edward Island conditions. The first test covered a period of five years, 1912-16, and the average returns from over 150 plots demonstrated that Banner oats was the leading variety. During the five seasons it produced 6 bushels and 2 pounds more grain than Old Island Black, and 7 bushels more grain per acre than Ligowo.

The second series of co-operative tests was with 12 farmers, for one year, with Banner and Victory oats, and the Banner oat again led in yield, and was much superior in colour and appearance to the Victory.

All promising new varieties of cereals originated through plant breeding at the Central Farm are tested out at the Charlottetown Farm. In addition to this, the best commercial sorts are all improved under the C. S. G. A. regulations by careful hand-selection. Each year the superior plants from each sort are propagated, multiplied, registered and sold as foundation stock to all who apply, the quantity distributed being governed by the amount of land available.

In the Division of Forage Crops, co-operative experiments with alfalfa have been carried out with farmers throughout the province. Inoculated soil has been sent out whenever requested, and while alfalfa is not believed to be as satisfactory a forage crop on Prince Edward Island as red clover, yet the farmers have received this information and have been saved the loss of having their fields bare. Many strains of alfalfa and other clovers have been tested over a period of years, and the hardiest recommended. Among the grasses, timothy stands in first place for hay. Red Top, orchard grass and meadow fescue

have shown that they are promising grasses for pasture.

The records show that corn cannot be counted on for a full crop every year, and the farmers are advised to sow oats, peas and vetches in mixture to replace corn in the off years. In good corn years, the oats, peas and vetches may be allowed to ripen, and will produce a heavy crop of grain. Work at this Station is only just being begun with sunflowers as a forage crop. In 1921 the Mammoth Russian produced 14 tons, 1,000 pounds per acre of green forage. This was fed to steers as a soiling crop. They ate heads, leaves and stalks clean. This method of feeding was recommended to a dairy farmer who had quite an area of sunflowers and no silo. He reported that his cows ate the sunflowers greedily and made good gains in their milk flow. Selected seed of the Mammoth Russian gave a good return of ripe seed.

Cultural Experiments

The work with roots has secured a turnip said to be resistant to club root; over 250 pounds of this seed being produced in 1921.

A series of six farm rotations was laid out in 1912, under a plan suited for demonstration. Accurate records have been kept, and the results from these different systems can be secured, not only through reports, bulletins and press articles, but every summer they are open to the eye of every farmer who passes on the train, or calls to spend a few hours at "the Farm." These have demonstrated methods of eradicating noxious weeds, and of steadily increasing the fertility of the land by applying manure at the rate of five tons per acre per year.

Perhaps the most interesting work, to the farmers, of all that has been undertaken by the Experimental Station is that connected with the cultivation of the soil by different methods. Over 300

plots are used in this investigational work. Several years were spent in draining and in getting the land as uniform as possible. The records now date back to 1916, and quite a number of press articles have been sent out based upon these experiments. A few of the deductions are: When seeding with a drill, rolling just before seeding gave better results than rolling after seeding, or when the grain was up. Fairly deep ploughing of sod (5 inches or over) gave better yields than shallow ploughing, and early autumn ploughing of sod gave much better crops than spring plough-

any spring ploughing. It is rather surprising to find that oats made one of the best nurse crops for seeding out land when sown at the rate of $2\frac{1}{2}$ bushels per acre. Barley sown at the rate of $1\frac{1}{2}$ bushels per acre gave 3 bushels and 12 pounds less grain than when sown thicker, but produced 600 pounds more clover the following year, and 1,200 pounds more timothy the second year than plots sown at the rate of $2\frac{1}{2}$ bushels of barley per acre.

The farmers, and more particularly the farmers' wives, that visit the Station every summer, take a very great interest



Experiments with Celery: Prince Edward Island Experimental Station.

ing. Land that has produced a hoed crop, such as potatoes or roots, usually produces a better crop if the seed bed is formed for the following grain crop without using the plough.

Results: Sod ploughed in August and top-worked in autumn gave 13 bushels and 5 pounds more oats per acre than sod ploughed the following spring. Even the poorest method of autumn ploughing gave 6 bushels per acre more oats than

in the gardens, orchards and small fruit plantations. In these, careful investigations have been carried on for many years to determine the best varieties of the different sorts of vegetables, fruits and flowers.

Experiments and demonstrations conducted with cultural and growing methods with all of the important vegetables and fruits, have enabled the Experimental Farm to greatly assist, and

to assure the success of a very large number of the home farm gardens. In fact, ripe tomatoes, which were a rare luxury in the province only a few years ago, are now common vegetables to be found throughout the country, selling at moderate prices.

Many of the better sorts of vegetables and flowers have been propagated for seed or tubers and sold or distributed to the schools, women's institutes and the farm homes of the province.

Live Stock Investigations

The Experimental Farm at Charlottetown was not planned originally for live stock work; enough stock was to be kept to operate the farm and to use the roughages and other surplus products from the investigational work with cereals and garden crops. Investigations in feeding lambs and steers have been carried on since the Farm was started; and valuable data on methods of feeding and housing have been published from time to time. An annual auction sale of stock always brings a large number of interested persons to the Farm. These are furnished with a detailed statement at the time of the sale, of the feeds, methods of feeding, and weights and gains of the animals auctioned. The kinds of pure bred stock now represented at the Farm are Clydesdale horses, Ayrshire cattle and Yorkshire pigs. Many of these have been shown at the leading fairs and exhibitions, and while no prize money has been accepted, a goodly number of the best prize ribbons now hang in the Superintendent's office.

The dairy cows are all entered in R. O. P. They have qualified in the past with good records. "Buttercup of Glenholm" No. 56491, this season broke the four-year-old record of Canada, giving 16,444 pounds of milk and 662 pounds of butter fat, with a test of 4.02 per cent. Three yearling bulls bred at this Station

are now at the head of the Ayrshire herds of three of the Experimental Stations in Eastern Canada.

Poultry Investigations

This Station led the way to one of the greatest advances that has ever been made in the poultry industry. The Dominion Egg-Laying Contest was started at Charlottetown in the autumn of 1918, and the success of the 1918-1919 contest has led to many others being started. These contests are now recognized as the most compelling force in the present very rapid development of the poultry industry. From these contests has grown the Record of Performance and the Registration of Poultry, which has enabled Canada to lead the whole world forward. The Experimental Farms System throughout Canada has adopted 150 eggs in the pullet year as the minimum for all breeding hens on the Farms.

The average profit over cost of feed on all the hens in the three Prince Edward Island contests was \$1.21 per hen. Estimating that the average hen in Canada earns a net profit of \$1 per annum, which is more than she does, and that as a result of the contests now being carried on, the profit may be increased to the average of the Prince Edward Island Egg Laying Contests, then the 31,324,498 fowls in Canada would earn a net profit of 21 cents more than at present, or in round numbers, they would produce \$6,500,000 to the financial advantage of Canada.

Drainage of Agricultural Land

When the Experimental Station was established in 1909, at Charlottetown, modern tile drains had not been laid, so far as we know, for agricultural purposes, in the province. The drainage of a large area of unprofitable land at the Station produced remarkable results.

This land, which did not produce enough barley to re-seed the land in 1910, has since produced over 50 bushels of barley, 35 bushels of wheat and 80 bushels of oats, respectively, per acre.

Experiments were conducted with subterranean outlet, and it has been demonstrated that a four-inch hole, drilled almost anywhere in the province to the level of the general water table, will carry off the water from a "pot-hole" or other swamp area not exceeding one acre in extent. One such outlet was observed to carry off the surface water at the rate of 20,000 gallons per day.

Bee Investigations

Many investigations have been carried on with breeds of bees, methods of preventing swarming, wintering of bees, and means of combating bee diseases. Beekeepers who have any difficulties are asked to apply as early in the season as

possible to the Experimental Farm for assistance. This we are ready to furnish to the limit of our ability. Last season the Bee Inspector visited every apiary that could be located in the province, and gave personal assistance or instruction. Demonstrations were given from time to time at the Station and at 5 centres throughout the Island to encourage those interested in this profitable phase of farming.

It is not possible in an article of this kind to sum up all the phases of the work and the discoveries that have been made. The majority of our activities are of such a character that it is impossible to make a reasonably correct financial estimate of their value to the province. The above facts, however, show some of the operations and policies, and are presented with the idea of enabling the farmers to make still more profitable use of their own Experimental Farm.

"There are many under-nourished or improperly fed children in this country, whose condition, both physical and mental, would be greatly improved by a more liberal use of milk in the diet."—*Dr. J. A. Amyot, Deputy Minister of Health.*

"Canada is one of the few remaining countries that offer agricultural lands on terms within the means of settlers of limited capital, located in a land of democratic self-government and with a climate acceptable and desirable to the white race."—*Agricultural and Industrial Progress in Canada.*

THE REINDEER INDUSTRY

BY E. A. WATSON, CAPT. C.A.V.C., CHIEF ANIMAL PATHOLOGIST, HEALTH OF ANIMALS BRANCH

TOWARDS the end of October, 1921, there was landed at Amadjuak, Baffin Island, a herd of domesticated Norwegian reindeer. The shipment was made by the Hudson's Bay Reindeer Company, and marks the beginning of an enterprise worthy of the traditions of the great company of "Gentlemen Adventurers" who have figured so prominently in Canadian history and development for two hundred and fifty years.

Further importations of reindeer are expected to follow, the plans of the company being to establish reindeer depots at various points in the northern terri-

genous to this country, the cariboo at one time inhabited the wooded swamps from Newfoundland to the Pacific Coast. Further north the arctic variety roamed in vast herds over the barren lands and the territories in Canada and Alaska north of the tree line. But in recent years reports of the failing numbers of the cariboo, and in many districts their complete disappearance, have come in from all quarters, from Esquimo and Indian tribes and experienced hunters alike. It would appear that the story of the vanishing buffalo and the starving Indians is to repeat itself with the cariboo and the northern tribes.



tories of Canada, and to develop an animal industry which will provide the means of subsistence to the native population and a new and increasing source of meat supply for southern markets.

Identical with the cariboo species, the reindeer does not figure in the popular mind as a domesticated animal and, in this country particularly, is regarded more or less as a wild creature to be hunted and shot down for food by prospectors, trappers, hunters, and explorers or as trophy for the man with a rifle who has just the desire to kill. Indi-

In northern Europe and Asia the Laplanders and tribes of Mongolian descent, as far back as their history can be traced, have lived on the native reindeer. These animals have furnished them with meat and milk, skins and clothing, with the means of transportation and the material for barter and exchange—in fact with practically all that was needed in their simple nomadic style of life. For ages past these people have been domesticating wild deer and raising herds of trained animals. But with the fringe of civilization penetrating their territories, with

the advent of missionaries, traders, tourists, collectors, and sportsmen, and with the accompanying ruthless slaughter of reindeer, the Laplanders saw their means of self-support and existence threatened. Realizing the danger in time, they built up their domesticated herds and firmly established their one and only industry. They now have reindeer in plenty for their own needs and export; and they furnish many of the Scandinavian and Russian cities with reindeer meat, which commands a price about equal with that of the best beef. To one not born to it, the Lappish life seems to be a hard one. But these people are of a hardy race and they love their mountainous plateaux, the great tundras, and the open life, whether it be in the treeless, snowy wastes of winter, when for three months the sun does not appear above the horizon, or during their sojourn on the fjord islands through the brief spring and the summer months of the midnight sun.

In April the flocks are brought from the interior to the coastal regions, and in many cases on to the islands. The deer enjoy the salt water and a swim of two miles or more across one of the fjords. They are carefully tended during the fawning season, and remain on the islands through the summer months to escape the plague of mosquitoes—the “grey terror” of Lapland—and grow fat. A cold rainy season is best for the deer. There is then an abundance of the moss on which the animals feed and thrive so well, and in September when the return journey to the winter ranges in the interior is commenced, they should be in a sleek and well rounded off condition with a slab of back-fat which will be needed and used up during the long, lean months of winter. It is said that a full-grown male deer should have in September a slab of back-fat three inches or more in thickness.

In summer the Laps move with pack-reindeer; but in the winter time, when most of the overland travel and work is carried on, sledge-reindeer are used en-

tirely. The flocks are then concentrated in the vicinity of the Lap villages, and the best and strongest male animals are broken to the harness. The sledge, called a pulka, is made of wood and shaped like a little narrow boat with pointed bow and square stern and with a rounded and keel-like bottom. It is usually made rather less than seven feet in length, though some measure up to nine feet, and is just wide enough for one person to sit in. A good draught reindeer will draw a load of from 250 to 300 pounds weight according to the condition of the snow. Winter transport and communication between the widely separated Lappish communities, to and from the coast with market produce and winter supplies, across Norwegian, Swedish, Finnish, and Russian Lapland, and the carrying of the overland mails, is done entirely with reindeer. The usual custom is to form a transport column of reindeer and pulka tied together in a single file. This is called a “radio.” On October 1 of last year, after the first heavy snowfall, the writer met several of these “raido” proceeding from the coast to the interior with the first loads of winter supplies. The snow was soft and the going slow and difficult. But when the snow is packed hard, travel is easy and rapid, and it is possible to cover 65 to 70 miles in a day. A great advantage of reindeer transport is that it is seldom necessary to carry food for the animals. They find it for themselves at the halting places en route, digging deep down through the snow to get the coveted moss. Furthermore, they have a reserve power which enables them to cover great distances with little or no food at all. With his remarkable spreading hoof a reindeer supports himself well on the crusted snow or, as in the summer season, picks his way safely and quickly among the mountain rocks and swamps where any other domesticated animal would find it hard to keep a footing.

Apart from his adaptability and usefulness as a beast of burden, the rein-

deer is a valuable food-producing animal. A Lapp, Johan Turi, has written in his book of Lappish texts that:—

“Man shall tend the reindeer, and the reindeer shall again provide livelihood for man, as to clothing and food. And man shall move with the reindeer back and forth, south and north; the pack-reindeer he uses as a means of transport, and the other loose reindeer are the herd.”

True it is that the reindeer is unique among man's animals in that it fur-

cessible field of exploitation up to the present time. The reindeer industry may be the means of opening the way to progress and development in the Northland.

It should be mentioned here that this importation of reindeer by the Hudson's Bay Company is not the first experiment of its kind on this continent. In 1898 the United States government imported reindeer into the Yukon territory for the relief of the miners, and drove a herd up into Alaska for the relief of



Hudson's Bay Company herd of Lapland Reindeer crossing the Alten River, Finmark, for embarkation to Baffin Land, Canada.

nishes altogether food, clothing and the means of transport. There is no other animal whose cost of maintenance is so small and whose return to man so relatively large.

This animal then appears to be admirably suited for the stocking of the vast non-producing lands of Northern Canada. It is known that these lands possess considerable natural resources and untouched wealth in oil and minerals. The unsolved problem of food and transportation has made this an inac-

shipwrecked crews of whaling ships. They then promoted the industry among the Esquimo tribes and mission stations, and by all accounts the herds have multiplied rapidly and now number many thousands of animals. Increasing quantities of reindeer meat are shipped south annually and marketed in United States cities. Some fifteen years ago a small herd of reindeer was shipped from Norway to Dr. Grenfell's mission on the coast of Labrador. It is said that the herd prospered well for the two or three

years it remained under the care of Lap herders, but became scattered and fell to pieces after the return of the Laps to their native land.

The Hudson's Bay Company wisely arranged for experienced Lap herders with their families to accompany the expedition to Baffin Island. A depot of supplies, building material and equipment has been established at Amadjuak for the Lap settlement. Pulka and skis for travel, sport and recreation, medical stores, books and reading matter have also been provided, the company anticipating the needs and requirements of these people, desiring their welfare and that they should form a happy, useful and contented colony.

The Department of Agriculture is interested in the reindeer industry as in all branches of live stock. Reindeer, hardy animals as they are, are subject to certain diseases and parasitical infestations. The writer, acting under the instructions of the Veterinary Director General, was sent to Norway to co-

operate with the Hudson's Bay Company in guarding against the introduction of disease with the imported animals and in giving the expedition a fair start and prospect of success. The conditions of the industry in Lapland were studied and a thorough inspection of the animals was made while they were being gathered up and again before actual embarkation. Six hundred and twenty-eight reindeer with a clean bill of health sailed for Baffin Land on the Hudson's Bay Company's steamship *Nascopie*, and excepting some casualties on the rough voyage across, were landed in good condition. The venture will be followed with much interest and hope for its success. Such an enterprise is a costly one and the Hudson's Bay Company is to be congratulated on the courage and thoroughness with which it has undertaken it. The reindeer industry may prove as applicable for parts of northern Quebec and New Ontario as for the lands farther north.

NEW VARIETIES OF APPLES ORIGINATED AT THE CENTRAL EXPERIMENTAL FARM

BY W. T. MACOUN, DOMINION HORTICULTURIST

IT is not our purpose to describe at length in this paper all the work that has been done at the Central Experimental Farm, Ottawa, in the origination of varieties of early and late apples suited to the requirements of the province of Quebec and to districts where a similar climate prevails, but rather to confine our remarks to what has been obtained when McIntosh and Northern Spy have been used as parents, as it is from these two varieties that the greatest promise is presented. From the McIntosh have been originated very promising sorts to cover the season from mid-August to December, and from the Northern Spy late keeping varieties that are also very promising.

Seedlings of McIntosh

The parents used with McIntosh for the purpose of obtaining longer keeping varieties than McIntosh have been Lawyer, Milwaukee, Malinda, and others, and although quite a number have been originated which are handsome in appearance and late keepers, none of them has been good enough in quality to come up to our ideal of what is desired. On the other hand, open pollinated McIntosh have given a large proportion of apples of good quality, handsome appearance, and of sufficient hardiness to withstand the test winter of 1917-18, and it is to five of these that we wish to call special attention.

Melba.—This is a seedling of McIntosh, which comes into condition in August, and has a relatively long season for a summer apple. It is of good size, handsome appearance, and very good quality. This is a red summer apple, comparing very favourably with McIntosh in appearance and quality. The tree is an early bearer, and it is a good cropper. This variety is firmer than most summer apples and should make a good shipper. We have no hesitation in recommending this for general planting in the province of Quebec where McIntosh succeeds. It is expected that there will be a few trees for sale in 1922 and more in 1923. The policy has been decided on of offering new varieties for sale until they can be obtained in quantity from nurserymen.

Joyce.—Also a McIntosh seedling fit for use from two to three weeks later than Melba, and continuing in season through September and October. It is of good medium size, a red apple, attractive in appearance, good to very good in quality, comparing very favourably in quality with McIntosh itself. While, perhaps, not quite as early a bearer as Melba, it is a fairly early bearer, and we highly recommend this to follow Melba in season. This also is being propagated for sale, a very few trees being available in the spring of 1922.

Pedro.—This McIntosh seedling is in season from late September to December, being ready for use about three weeks after the Joyce, and keeping much longer. It is, perhaps, the handsomest of the three, being a lively attractive shade of red and having a perfume. While the Melba and Joyce are subacid, this may be called briskly subacid. The quality is good. This variety is recommended to replace Wealthy when an apple of better quality is desired. The tree is evidently very hardy, is a vigorous grower, and is a regular and heavy bearer. Trees of this will soon be available in quantity as it is a variety which

it is believed will soon make a name for itself.

Lobo.—Lobo is a McIntosh seedling, which is in season just before McIntosh, following the Pedro by two or three weeks. This is one of the most highly coloured of the McIntosh seedlings, and has already fruited in the province of Quebec, and is considered very promising for Quebec to come in before McIntosh. It is very like McIntosh in flavour. Trees of this variety are being propagated for sale.

Patricia.—By some persons, the Patricia is considered the best dessert apple of all these McIntosh seedlings, but, as a commercial apple, it may not prove quite large enough unless severely thinned, as it bears very heavily in rope-like masses. The character of flesh of this apple is superior to any of the others, and the quality is also very good. The fruit is deep red in colour, and is in season from October to December. This is particularly recommended for home use.

Many more seedlings of McIntosh have fruited, some of which have been named, but the foregoing five varieties are the ones which it is our purpose to introduce as rapidly as possible as it is believed that they are a real acquisition to the varieties now being grown. From the open pollinated seedlings of McIntosh there have been very few which are later in season than McIntosh, and those which are later are not good enough in quality.

Seedlings of Northern Spy

The Northern Spy has been crossed with Milwaukee, Lawver, North Western Greening, Walbridge, and others at Ottawa in the hope of obtaining hardy late keeping apples of good quality and while from these crosses many long keeping sorts have been obtained, most of them are not quite good enough in quality to meet our desire. On the other hand, from open pollinated trees there

have been a large number of seedlings of good quality, some of which are long keeping apples.

The Northern Spy is long in coming into bearing, and the seedlings of it have been later in bearing, on the whole, than the McIntosh seedlings; hence they have not been under observation so long, and we cannot speak as confidently of the hardiness of these as of the varieties previously described. However, a number of them withstood the test winter of 1917-18 and, while another test winter is desired to note its effect on a larger number of trees of these promising sorts, yet the names and characteristics of some of these may be mentioned as they are certainly better in quality than such varieties as Scott Winter and Bethel, and have a good deal of the Spy flavour.

There are eleven of these winter seedlings of Northern Spy which have been named and which may be briefly described here as at least one or two of them will, no doubt, be found hardy enough for commercial planting. They are referred to alphabetically as they are all good in quality and, as hardiness is the first consideration after quality, and their relative hardiness is not certain yet, it is thought that this is the best way to refer to them.

Ascot.—Fruit medium to large in size, roundish to oblate; predominant colour crimson; flesh yellowish with traces of red, crisp, tender, juicy; flavour subacid, pleasant; quality good; season November to middle of February or later. Resembles Northern Spy a little in outward appearance and considerably in flesh and flavour.

Bingo.—Fruit above medium to large, roundish conical; predominant colour crimson; flesh yellowish with traces of red, tender, moderately juicy; flavour subacid, sprightly, spicy, pleasant; quality good; season December to late winter. Resembles Northern Spy considerably in outward appearance, flesh and flavour.

Donald.—Fruit above medium to large, oblate to roundish, regular; predomini-

ant colour crimson; flesh yellowish, crisp, tender, rather coarse, juicy; flavour subacid, sprightly, pleasant; quality good; season late October to March or later. A handsome apple, resembling Northern Spy somewhat in colour.

Elmer.—Fruit medium in size, roundish; predominant colour deep crimson; flesh yellowish, crisp, tender, juicy; flavour subacid, sprightly, pleasant; quality good; season January to late winter. Looks and tastes considerably like Northern Spy.

Emilia.—Fruit medium to above medium size, roundish conical; predominant colour crimson; flesh dull white, crisp, juicy, tender; flavour briskly subacid, pleasant; quality good to very good; season December, probably to April. Resembles Northern Spy in colour, shape, flesh and flavour. One of the best but also one of the latest to come into bearing.

Niobe.—Fruit above medium size, roundish, regular; predominant colour rather dull crimson; flesh yellowish, crisp, tender, moderately juicy; flavour mildly subacid, but sprightly, pleasant; quality good to very good; season December to late winter. Resembles Northern Spy a little in outward appearance and considerably in flavour. Very popular with most who try it. One of the first to come into bearing, but tree does not seem quite as hardy as some of the others.

Rosalie.—Fruit above medium size, roundish; predominant colour dull carmine; flesh white, crisp, tender, juicy; flavour subacid, sprightly, spicy, pleasant; quality good; season late November probably through the winter. Somewhat like Northern Spy in character of flesh and flavour. Not quite attractive enough in appearance.

Sparta.—Fruit medium size, roundish; predominant colour crimson; flesh yellowish, crisp, juicy; flavour briskly subacid, pleasant; quality good; season December to late winter. Resembles Northern Spy somewhat in flesh and flavour.

Spiotta.—Fruit medium to large, oblate to roundish conic; predominant colour crimson; flesh dull white or yellowish, crisp, tender, juicy; flavour briskly subacid, pleasant; quality good; season November to February or later. Resembles Northern Spy considerably in colour, flesh and flavour.

Spiro.—Fruit medium size, oblate to roundish; predominant colour deep crimson; flesh yellowish, crisp, tender, juicy; flavour subacid, sprightly, pleasant; quality good; season November, probably to March or later. Resembles Northern Spy considerably in flesh and flavour.

Wilgar.—Fruit above medium to large, roundish conical; predominant colour crimson; flesh yellowish, tender, juicy; flavour subacid, pleasant, though not high; quality good; season December to March. Resembles Northern Spy considerably in outward appearance, colour, shape, flesh and flavour.

The length of time required to originate, fruit, and popularize a new apple is very considerable. The first seed from which promising varieties have come

was sown at the Experimental Farm in 1898, or twenty-three years ago, but it is expected that it will take nearly twenty years more before certain varieties, which are now being propagated for dissemination will have produced fruit enough so that one can find it in large quantities on the market.

Following are the various stages through which a new variety must pass from the sowing of the seed until fruit is obtained in large quantities:—

	Years
From sowing seed to planting seedling trees in fruiting rows.....	3
From planting to bearing.....	5
From bearing to confirming characteristics of fruit.....	5
From propagation to setting in orchard.....	3
From planting propagated trees in orchard to fruiting of same.....	6
If approved by nurserymen, time for nurserymen to build up a stock for sale.....	3
From time of sale until trees are in full bearing in fruit growers' orchards.....	10
To popularize fruit after it is available.....	5
Total.....	40

THE DOMINION EDUCATIONAL BUTTER SCORING CONTEST, 1921—FINAL RESULTS

BY GEORGE H. BARR, CHIEF, DAIRY DIVISION

THE contest covered six months from May to October inclusive. All the provinces provided a 14 pound box sample from a different creamery each month, except British Columbia, which did not send a sample in October, making a total of 53 creameries participating in the contest.

Of these, 32 had sent samples to the 1919 and 1920 contests, leaving 21 which had not competed before. The butter from these 21 creameries was quite close as regards texture, with the moisture fairly well incorporated, which indicates that the buttermakers throughout the Dominion are making a fairly uniform type of creamery butter, and I think it can be justly said that the Dominion Educational Butter Scoring Contest has

played an important part in bringing this about.

The scores for flavour in 1921 were considerably higher than in the 1920 contest, the percentages being as follows:—

50.9 per cent of the samples graded Specials	
34.0 "	" " " No. 1
15.1 "	" " " No. 2

STANDING BY PROVINCES ACCORDING TO GRADES

	Special Grade	First Grade	Second Grade
1. Manitoba.....	6	.....	.....
2. Quebec.....	5	1	.....
3. Saskatchewan.....	4	2	.....
4. Alberta.....	3	3	.....
5. British Columbia.....	2	3	.....
6. Prince Edward Island.....	2	2	2
7. Nova Scotia.....	3	2	1
8. Ontario.....	1	3	2
9. New Brunswick.....	1	3	2

Average of the scores for flavour and total scores on all samples from each province:—

	Average Score for Flavour	Average Total Score
Manitoba.....	41.95	96.65
Quebec.....	41.41	96.16
Alberta.....	41.16	95.85
Saskatchewan.....	40.91	95.26
Nova Scotia.....	40.08	94.31
British Columbia.....	40.10	94.04
Ontario.....	39.41	93.70
Prince Edward Island.....	39.50	93.36
New Brunswick.....	39.16	92.83

Standing for Workmanship by provinces based on the scores for texture, Incorporation of Moisture, Colour, Salting and Packing; total 55 points:—

	Average of Scores
Quebec.....	5.75 points
Manitoba.....	54.70 "
Alberta.....	54.68 "
Saskatchewan.....	54.35 "
Ontario.....	54.28 "
Nova Scotia.....	54.23 "
British Columbia.....	54.04 "
Prince Edward Island.....	53.95 "
New Brunswick.....	53.66 "

Number of samples from each province scoring full for Texture, Incorporation of Moisture, Colour, Salting and Package:—

	Texture	Incorporation of Moisture	Colour	Salting	Package
British Columbia.....	3	3	2	4	4
Alberta.....	2	6	5	6	6
Saskatchewan.....	2	4	3	6	3
Manitoba.....	3	6	4	6	6
Ontario.....	1	4	5	6	4
Quebec.....	3	5	5	6	6
New Brunswick.....	3	2	3	3	4
Nova Scotia.....	3	3	5	4	6
Prince Edward Island.....	1	4	4	4	2
Totals.....	21	37	36	45	41

"The finest proof of the standing of agricultural education in Canada and the excellence of the agricultural colleges of the Dominion was given at the Chicago International Livestock Exposition when the Ontario Agricultural College at Guelph, the Manitoba Agricultural College at Winnipeg, and the Macdonald Agricultural College of Quebec covered themselves with glory in the judging contests, winning the first prize in individual standing as well as other awards."—*Agricultural and Industrial Progress in Canada*.

PART II

Provincial Departments of Agriculture

AGRICULTURAL INSTRUCTION IN QUEBEC

Particulars of Work Performed under the Agricultural Instruction Act during the First Nine Years of Operation

ONE of the conditions of the agreement entered upon by the Dominion Minister of Agriculture and the Quebec Minister of Agriculture was that there should be no reduction in provincial appropriations, in other words, that the Dominion subsidy was not to be applied to any extension or educational work already arranged for, but that it should be used for the furtherance of the work, especially school agriculture and post school work. Not only has this requirement been faithfully complied with, but the appropriations voted by the Quebec Legislature have been substantially increased year by year. The total amount spent in 1912-13 was only \$436,133, while it had reached the sum of \$1,162,103 in 1920-21, not including the Dominion subsidy, amounting to \$271,113.76.

Several new divisions were created during the last nine years and considerable work was done, as may be seen by the following brief summary.

Agricultural Colleges

There are three agricultural colleges in the province of Quebec: Macdonald College, affiliated to McGill University; the agricultural school of Ste-Anne de la Pocatière, affiliated to the Laval University, Quebec; and the Oka Agricultural Institute, affiliated to Montreal University. All three are subsidized. A fourth institution for the teaching of agriculture will be built at Rimouski in 1922;

it will be the property of the Quebec Government; the three above-named colleges belong to corporations.

The complete course is of four years, and a degree of B.S.A. is given. There is also a course of two years and several short courses.

As a special report is to be supplied by Macdonald College, it will be sufficient to give some information on the Ste. Anne school and the Oka Agricultural Institute.

The Ste-Anne de la Pocatière school was founded in 1859. Before 1913, it could accommodate only sixty pupils, but an annex was built since at a cost of \$108,000, and it can now receive 125 pupils. A grant of \$60,000 was given for this construction. In 1913 there were five teachers; there are now thirteen. Several of them have completed their course of studies in American or European universities. The laboratories of chemistry, microscopy, plant pathology, botany, cereals, and physics have been reorganized. The professors of the school have also done considerable teaching work outside of their institution in the counties of Lower Quebec. They have given short courses in 52 parishes of their district, as well as a large number of lectures and demonstrations.

The Oka Agricultural Institute dates from 1893. There are 17 professors at this institute, several of whom have studied at Guelph, Cornell or in Europe.

With the help of a subsidy of \$50,000, payable in ten annuities of \$5,000, an annex was built in 1914 at a cost of \$62,000, which has enabled the management to receive a larger number of pupils and better equip the scientific laboratories and museums.

During these nine years, the Oka Agricultural Institute has continually endeavoured to improve its agricultural teaching. Before the Agricultural Instruction Act was adopted, the duration of the course was three years; it is now four years and it includes all the branches of agriculture taught in agricultural institutions of other provinces. Up to date, 110 pupils have obtained their diplomas of B.S.A.

In addition to class work, the pupils go through a splendid course of practical training by means of daily labour and daily observations in the various departments of the farm. With this view and in order to make teaching more efficient, several departments have made purchases or accomplished work which is worthy of mention. Pure bred cattle and horses of high breeding were purchased by the live stock department. A judging arena was constructed, the cow testing work, officially started in 1918 and scrupulously carried out, has been the means of putting through for the Record of Performance 38 cows, with an average production of over 10,000 pounds of milk.

The fruit-growing department has made a number of experiments on orchard spraying and arranged each year for fruit-packing competitions. This department has also competed in a number of provincial exhibitions and won several gold medals, notably at Quebec and Sherbrooke, as well as the first prize at the fruit exhibition held at Ottawa in the autumn of 1921.

The poultry department has carried on very interesting experiments on the value of green food in the feeding of fowls and the advantages of caponizing for the market. Many competitions have

been organized by the superintendent and his assistants on judging fowls for the fairs, the killing of fowls, as well as the laying contests. Lastly, after many years of careful work, the Oka Agricultural Institute has introduced a new breed of fowls, "Chantecler," created by Rev. Bro. Wilfrid, superintendent of the poultry department, and registered in the Standard of Perfection in 1921.

Two valuable bulletins were prepared by professors of the Oka Agricultural Institute and distributed by the provincial Department of Agriculture: "Fruit culture" by Rev. Fr. Léopold and "Ten Years Experience in Poultry Work," by Rev. Bro. Wilfrid.

The agricultural school of Ste-Anne de la Pocatière, the Oka Agricultural Institute and the Macdonald College have received in 1921 \$120,500, of which \$75,000 came from the Federal grant.

School of Veterinary Science

The School of Veterinary Science is affiliated to the University of Montreal. It receives a grant from the provincial government and also one from the Dominion Government, under the Agricultural Instruction Act. This school has made great progress since 1913. The programme has been improved, the number of courses has been increased, a veterinary hospital has been built, for which it has received a special subsidy of \$5,000 per year since 1918. It has been recently decided that, starting from this year, the third and fourth-year pupils must spend at least four weeks at the Oka Agricultural Institute.

The school of Veterinary Science has recently been recognized as an accredited school by the American Veterinary Association.

Unfortunately, there has been a tendency towards a decrease in the number of pupils during the last few years. This is due to several causes but mainly to special conditions arising from the war. However, ten new students registered in the month of September, 1921.

Domestic Science Schools

There were 34 domestic science schools in 1913; there are now 65. The most important of these schools are that of Roberval, the first domestic science school in America, being established in 1882; that of St-Pascal, the provincial domestic science school of Montreal, those of Macdonald College, Sutton, Montebello, and Ste-Martine. These institutions receive grants varying from \$1,000 to \$3,000 per year. The others receive \$300 each per year.

Most of the professors in these schools have qualified in domestic science at the Roberval, St-Pascal, Montreal and Sutton schools, which give special courses for teachers.

Most of these schools are well equipped; all sorts of domestic work are taught as well as all the farm work that farmers' wives may be called upon to perform, and specially bee-keeping, poultry keeping and horticulture. Most convents have spinning wheels, and weaving looms. Our domestic science schools are attended by over 8,600 pupils.

The total grants received amount to \$51,000 of which \$10,000 comes from the Dominion subsidy.

Field Crops and Livestock

The greater part of the grants which were given for the development of this branch under the Agricultural Instruction Act have been spent on seed selection and on the maintenance of demonstration plots.

A clover seed production campaign has been conducted in almost all the districts of the province, for demonstrating the advantages of clover seed growing and encouraging the farmers to grow their own seed. During the last few years, two or three clover seed hullers operated by the Department, and threshing demonstrations were given in the main clover growing centres. The clover seed crop almost nil ten years ago, is now an important crop.

During the winter of 1920-21, some 1,257,113 pounds of clover seed were threshed by the farmers. Of this quantity, 52,738 pounds were threshed in various districts by the machines of the Quebec Department of Agriculture.

As regards the production of cereal seed, a number of lectures were given by our special officers on the choice of varieties and the selection of seed. A great many field crop competitions and seed fairs were organized with the co-operation of the Dominion Department. It is mainly through these efforts that the farmers of the province have come to realize the advantages derived from the use of good seed, and that a general scheme of organization insuring rapid progress in the production of choice cereals in the province of Quebec has been carried out.

Space does not permit to enumerate all the work done for the development of live stock by our agriculturists, the officials and instructors of the council of agriculture, which constitutes a branch of this Department. The assistance given towards the live stock industry includes many subsidies given to agricultural associations and farmers' clubs.

Besides, the greater part of the money spent to promote live stock breeding is voted by the Legislature and only \$9,000 of this amount has come from the Dominion grant for the last few years. This amount has enabled us to secure the services of some new instructors, who are doing excellent work with the co-operation of the Dominion Live Stock Branch.

Poultry Keeping

A great change has taken place in poultry keeping during the last ten years. It may be said that scientific poultry keeping was unknown or almost unknown in 1910. Since then, scientific methods of breeding and marketing have been introduced throughout the province, and these are becoming better

known and more generally adopted year by year. The chief of these methods may be enumerated as follows:—

1. Introduction in all districts of hygienic poultry houses, termed "Cold poultry houses," independent from stables and barns, where for the last three centuries poultry and cattle have been living together. This change necessitated a rather radical selection, as degenerated flocks do not stand the cold.

2. Establishment of fattening stations, which have also helped in selection work, so necessary. As early as 1912 some twenty-two stations fattened in three months 30,000 chickens with a profit of from \$2 to \$3 per dozen.

3. Introduction of pure-bred breeding fowls, of the utility type.

4. Gradual establishment of small breeding stations, under the supervision of special instructors. The average number of poultry stations operating each year for the last ten years has been twenty. The total is at least two hundred.

5. Distribution of eggs from pure-bred fowls to boys' and girls' clubs and women's institutes. From 30,000 to 35,000 eggs are now distributed yearly.

6. Organization of special stations for co-operative incubation; actual number, 5. Individual hatching capacity per year, 15,000 to 30,000 eggs.

1913

8 instructors.
30 fruit-growing stations.
No other field of demonstration than the 30 above mentioned stations.

9,308 school-gardeners in 284 schools.
84 lectures given, 700 demonstrations and 1,050 visits.
10 school fairs.
Only two publications on horticulture.

Among the most important results obtained during the last nine years, special mention should be made of 125,000 apple trees, 900,000 strawberry plants and 20,000 raspberry bushes, not including ornamental trees and other shrubs,

7. Assistance given in various districts to the construction of farm poultry houses. The owners of these poultry houses agree, as a return for this assistance, to submit to some measure of control and supervision by the Department of Agriculture for the following years.

8. Establishment of a regular poultry division which has employed for years some fifteen officials, the latter following short courses, exhibitions, supervising stations and competitions, and giving lectures and demonstrations.

9. Organization in 1919 of a provincial poultry association which becomes the central body for the fifteen districts, and other associations.

10. Encouragement given to the raising of rabbits and turkeys and to the creation of a breed of fowls, the "Chantecler," specially adapted to the climatic conditions of this province.

In 1920-21 the poultry division had at its disposal a total grant of \$33,000, of which \$18,000 came from the Dominion subsidy.

Horticulture

The following comparative statement for the years 1913 and 1921 will give an idea of the development of horticulture:—

1921

21 instructors.
34 fruit-growing stations.
12 fields, vegetable growing.
47 fields, potatoes.
67 fields, small fruits (bush).
22 fields, tobacco, and in 1919, 37 fields, sugar beet.
21,217 school-gardeners in 1,205 schools.
390 lectures, 2,076 demonstrations and 5,251 visits.
111 school fairs.
Since 1914, 14 publications printed.

distributed throughout the province by the horticultural division, so that the members of horticultural organizations might secure trees and shrubs of known quality. It is a well-known fact that the growing of fruit, vegetables, flowers, to-

bacco, and potatoes, as well as the canning industry and the horticultural industry, specially among the young, has greatly developed in this province since 1914.

The horticultural division was established in 1914. Its total appropriation in 1920-21 was \$69,000, of which \$39,000 came from the Dominion subsidy.

Dairying

The Dominion subsidy has been of great assistance in the development of the dairying industry in general and of our system of inspection in particular. During a few years, a total amount of \$25,000 was set aside for the salaries and the travelling expenses of inspectors, but owing to the fact that the provincial appropriations were constantly increased, this federal grant was reduced to \$5,000.

The butter and cheese factories' inspection staff includes 49 inspectors, covering the whole province. These inspectors are under the direction of five assistant-general inspectors, each of whom is responsible for nine or ten districts. These assistants are themselves responsible to the general inspector of butter and cheese factories.

The inspection of factories is carried on from May to November of each year and so has enabled the province to make great strides forwards during the last ten years, as the following statement will show.

In 1916 the various grades of cheese were in the following proportion: No. 1, 46.476 per cent; No. 2, 48.232 per cent; No. 3, 10.299 per cent. In 1919, the proportions were as follows: No. 1, 75.32 per cent; No. 2, 22.32 per cent; No. 3, 1.35 per cent.

As to our butter, its reputation has been established for a long time. The superior quality of our butter is recognized, not only at the Toronto exhibition and other exhibitions, but on all the principal markets. In 1918 the proportion of No. 1 butter was 94.48 per cent.

These results are due to the competence of the makers and to the good condition in which are the majority of the factories. In 1915 cement floors were found in 790 factories and the drainage system was good in 983 factories. In 1917 there were 1,139 cement floors and 1,372 good systems of drainage, which is an increase of 349 and of 389 respectively in two years. In 1915 there were, according to the statistics, 376 cheese-curing rooms built according to our plans. In 1917 the number was 541, or an increase of 165.

Cow testing has made wonderful progress during the last few years, on account of the joint action of the Dominion and Provincial Departments of Agriculture. All our inspectors of butter and cheese factories as well as all our district agriculturists have lent assistance. Over two-thirds the number of cows under test in the whole of Canada are now found in the province of Quebec.

All our makers receive their training at our provincial dairy school. They must now have a diploma of this institution.

The payment of milk by fat will become compulsory on the 1st of January, 1924, under an Act passed last year.

The total expenditure in 1920-21, on account of the development of the dairy industry, was \$150,000, \$5,000 of which was taken from the Dominion grant.

District Agriculturists

The first five official agriculturists were appointed in October, 1913, the first year during which a subsidy was granted by the Dominion Government. The following year a total of \$10,000 was set aside for their salaries and expenses.

This system of agriculturists has grown very rapidly since it was inaugurated. In nine years' time practically all counties of the province were provided with agriculturists.

The growth of this system is shown in the following table:—

Year	Number of agriculturists	Assistant agriculturists	Number of counties
October, 1913	5	..	10
July, 1914	5	1	10
" 1915	6	2	11
" 1916	9	2	16
" 1917	14	10	27
" 1918	20	20	37
" 1919	34	30	37
" 1920	49	32	43
" 1921	49	19	51
February, 1922	55	16	55

The following figures give some idea of the work performed by agriculturists during the last fiscal year, i.e., from July 1, 1920, to June 30, 1921. During this period, 2,501 lectures and 4,179 demonstrations were given; 273 field demonstrations, 253 school gardens, 25,206 home gardens, 107 school fairs, 56 vegetable competitions, 38 stable competitions were organized and supervised; 38,613 visits were paid; 16,836 visitors were received; 48,093 letters were written and 20,688 publications were distributed.

Special attention was given to sheep raising and 629 demonstrations on dipping were held during which 29,405 sheep were dipped. This dipping has given excellent results and caused great improvement in the quality of the wool marketed.

The work of the agriculturists includes the whole of the agricultural field, the organization and supervision of agricultural associations, farmers' clubs, etc., of demonstration fields and competitions of all kinds.

All agriculturists performed extremely useful work during the war; they were the main factor in the campaign of greater production in all counties and parishes. They were also the chief organizers of the 842 rural committees that operated in 1918, and the increase of 700 per cent in the production of wheat, of 40 per cent in that of hogs, of 100 per cent in peas and beans and of over 800,000 acres in field crops during a single year is partly due to the work of the agriculturists, which already covered a considerable part of the province.

In 1917, a beginning was made in supplying motor cars to the agricultur-

ists. A first trial was made with four machines. To-day all agriculturists, with the exception of two, use motor cars. At first, these cars belonged jointly to the Department and to the agriculturists. It was believed that this system would insure taking greater care of the machines. There were some objections, however, and the Department now owns all these machines. The motor cars give entire satisfaction if the car used is light and comparatively cheap. It enables the agriculturists to do more work and it does not cost so much as horses.

The first secretaries to agriculturists were engaged in 1918 and their number increased with the growth of this system. There are now twenty such secretaries, stationed in most extensive and best organized districts. Each agriculturist's office costs from \$2,000 to \$4,000 per year.

Few districts are now vacant and in a year or two every county in the province will have an agricultural information office. Counties desiring to have the benefit of an agriculturist must grant at least \$250 which amount is added to the yearly salary of the agriculturist. In 1921, three counties granted from \$600 to \$900; seven counties, \$500; nine, \$400; the others varying from \$250 to \$400.

A total of \$187,000 was spent by the Department in 1920-21 for the maintenance of this service, of which \$69,000 was taken from the Dominion subsidy.

Bee-keeping

Apiaries have been inspected in the province of Quebec since 1908, but it

was only in 1918 that a regular bee-keeping division was organized and that bee-keeping made real progress.

In 1913 there were only six inspectors of apriaries; there are now 20. Their work consists in spreading a knowledge of bee-keeping, encouraging the people to take up the industry, making demonstrations and combating foul brood disease.

A number of experiments on wintering bees have been conducted and seventeen wintering cases were distributed by the Department. These have now been used for four years and appear to demonstrate that wintering bees outdoors is practicable in the greater part of the province of Quebec.

Since 1918 short courses have been held each year in the chief centres of the province. These have created much interest in bee-keeping and many small apriaries have been started as a result of this work. Five bee-keeping associations are subsidized by the Department.

The bee-keeping division costs every year \$27,000, of which \$7,000 is paid under the Agricultural Instruction Act.

Tile-draining

The grant which has been distributed with the object of encouraging the reclaiming and particularly the underdraining of lands has enabled us to establish a tile-draining division.

The officials in charge of this work have, for the last few years, prepared and distributed, free of any charge, many plans for drainage at the request of farmers. They have, in addition, supervised important work in connection with the reclaiming of farms. Several demonstrations with ditch digging machines have been given. In a number of cases tile draining should be preceded by better superficial draining of water, through open ditches. In order to facilitate this work the engineers of the Department have made at the request of

many parties, hundreds of inspections, specifications and estimates in connection with this work.

Maple Sugar Industry

Three sugar-making schools were inaugurated in 1914. They received that year seventeen pupils and 1,573 visitors. A fourth school was opened in 1916 and the four establishments received altogether 42 pupils and 2,459 visitors. Only one school has been in operation since 1920.

In 1916, with a view to reaching as many sugar-makers as possible, it was thought that instructors visiting maple groves and spending a day making sugar or syrup in each of them would do more good than sugar-making schools. Many demonstrations have been given since then to teach the best methods of making. In 1921, 102 demonstrations on the spot were given by seven instructors in 29 counties, with a total attendance of 5,584 persons, most of whom were makers or persons interested in the making of maple sugar and syrup.

Some experiments have been carried on at the sugar-making school of Ste. Louise, the only one that is now in operation, in order to determine the proportion of sugar, the quality and the thickness of the sap, taking into account the depth, the size and the height of the hole on the tree.

Two special exhibitions of maple products were held in Quebec in 1918 and 1920 and were very successful.

Short Courses

This teaching is given by means of short courses of one week at each place. These courses are held during four or five months each year for agricultural purposes, but the domestic science courses, for farmers' wives, are held during ten months.

The agricultural short courses deal with the following problems: rural economy, rotations, soil, fertilizers,

amendments, drainage, ploughing, prairies and pastures, the growing of cereals and field roots, the control of weeds and diseases; dairying, cow testing, raising of calves, colts, swine and sheep; the feeding and lodging of cattle; raising of butcher cattle, the production of wool, poultry keeping, bee keeping, gardening, horticulture; the production and making of maple sugar and syrup; agricultural fairs, colonization, farm machinery and problems of rural sociology.

Domestic science courses are given to 60 farmers' wives' clubs, housekeepers' clubs and the women in general. They include house and food hygiene, the administration and decoration of the house, the domestic textile industry of wool and flax; cooking, sewing, mending; care of the children, home nursery

and care of the old; horticulture, floriculture, canning, bee-keeping, poultry-keeping, and social problems.

Between 1912 and 1922, with a small increase in the teaching staff, the work has been increased five times and our methods of class-room teaching and practical teaching have been improved. The full outfit of demonstration, miniature models, tables, specimens, moving pictures and lantern slides, lend greater attraction to the lectures of our experts. Most of our teachers are graduates of the agricultural colleges and higher domestic science schools.

The following table gives a summary of the work accomplished during the last nine years in the province of Quebec, by travelling courses of agriculture and domestic science:—

Years	Places visited	Teaching staff	Lectures given	Demonstrations	Attendance
1912...	19	12	244	101	12,700
1913...	62	18	237	24	28,201
1914...	59	20	205	57	25,721
1915...	11	17	374	24	18,800
1916...	19	18	612	34	48,198
1917...	34	22	665	80	40,376
1918...	39	21	594	94	30,550
1919...	42	23	598	125	52,397
1920...	64	22	817	196	56,358
1921...	121	26	1,232	299	80,994
Total...	470	199	5,578	1,034	394,295

MACDONALD COLLEGE

School of Agriculture

Animal Husbandry.—The appropriation to this department has been devoted to three main purposes. One assistant in the department has been maintained. His work until recently has been largely extension work in connection with sheep and the expenses incidental to such work have been charged to the federal grant. The first year the appropriation was received, three demonstration flocks of Cheviot sheep—ten to a flock—were imported from Scotland and established in the province. In 1915, these were sup-

plemented with six flocks more. When the Cheviots were introduced they were almost unknown in the province. From the originals twenty-five flocks have been established, mostly in sections of the province where sheep were in great need of improvement. Some of these flocks have grown to fifty head and from them many rams have been distributed to grade flocks, and selections from them have been sent to practically every province in the Dominion, experimental farms in five of the provinces receiving rams from them. Largely because of

this Cheviot work in Quebec, registrations of pure bred Cheviots have grown from five in the first flock book to well over a thousand at the present time.

Cereal Husbandry.—The funds provided have been devoted to investigation, and to the extension of a number of the results obtained by the department's work. The grant has made possible a complete series of investigations on the cultural requirements of root crops, their improvement by selection and crossing, and the growing of root seed. Definite data have been obtained as to the best cultural practices to be followed in Quebec. Decided improvement has been effected in yield of dry matter per acre, uniformity and keeping quality. It has been clearly demonstrated that home grown root seed is superior to that usually found on the market and forms the most reliable source of supply.

Since 1919, the funds have been devoted largely to the extension of the results obtained by this department through selection and breeding. Alaska oats have been found most suitable to certain sections of the province and their more general use in those areas has been encouraged. Similarly, another variety of oats is being tested as to its adaptability to local conditions with a view to its wide dissemination. Northwestern Dent Corn and Quebec 28 have been multiplied and disseminated widely.

Alfalfa and Fall Rye, as the result of numerous local tests, have shown their suitability for certain conditions in the province and their use has been encouraged.

Chemistry.—The investigation of maple sap products was undertaken under the provisions of the Agricultural Instruction Act, and is reported in *The Agricultural Gazette of Canada*, January-February, 1922, No. 1, Vol. IX.

Entomology and Zoology.—In this department a lecturer is employed under The Agricultural Instruction Act. His teaching duties take up most of his time

during the college session, but in the summer he devotes himself largely to entomological investigations.

A brief resume of the department's activities during the period under consideration follows.

1. The life history of *Phyllotreta zimmermanni*. This insect was first recorded for Canada in 1913 as a pest of turnips and other cole crops. In the adult stage it resembles closely in appearance and habits the striped turnip flea-beetle (*P. vittata*), but it passes its larval stage as a miner in the leaves of pepper grass.

2. The Bud moth (*Tmetocera oceliana*). Considerable attention was given to this insect which is a serious pest of apples in Quebec. Its life history, habits, food plants and parasites were studied and three seasons were spent in experiments on its control. The more important results of this study were published in 1917 in the report of the Quebec Society for the Protection of Plants.

3. Studies on *Coccobacillus acridorum*. At the request of the Dominion entomologist, and in collaboration with the bacteriological department of the college, investigations were undertaken to determine the practicability of using this bacterial disease in controlling locusts in Canada. The disease was studied thoroughly in the laboratory and in the field, as were also those habits of the locusts which brought them into relation with the disease. It was found impracticable to use this method of control in Canada, largely owing to the presence of an extensive indigenous intestinal flora of related organisms which immunized the locusts against the disease.

4. Report on *Tychius picirostris*.—This European insect was discovered injuring clover in 1915. It has been kept under observation since that year. In 1916 there was a slight increase in its activities but there has been no marked injury since.

5. Research in progress—(a) Studies on soil protozoa. (b) Relation of cer-

tain sucking insects to the transmission of plant diseases. (c) Life history of a haemosporidian of ducks. (d) Morphology and development of *Ornithodoros moubata*.

6. The preceding account deals with investigational work. In addition to this, advice is given freely on the control of insect pests; to this end many visits have been made to fields, orchards and gardens. Last year, in collaboration with the horticultural department, demonstrations were given on the control of root maggots in truck gardens in the vicinity of Montreal.

7. *Papers published*—The Wavy-striped flea-beetle.—Can. Ent. XLVI., p. 433, 1914. On the nervous system of *Sphida Obliqua* Walker.—Trans. Roy. Soc. Can. VIII., 225, 1914. Some insect parasites of the bud moth.—Seventh Rept. Que. Soc. Prot. Plants, 1915. Two bacterial diseases of injurious insect larvae.—Seventh Rept. Que. Soc. Prot. Plants, 1915. The occurrence of *Tychius picirostris* on clover at Ste. Anne's, Que.—46th Rept. Ent. Soc. Ont., 1916. Death-feigning reactions in *Tychius picirostris*.—Journ. Animal Behaviour VI., 1916. Experiments on the control of locusts with *Coccobacillus acridiorum* d'Herelle (with J. Vanderleck).—47th Rept. Ent. Soc. Ont., 1917. Studies on *Coccobacillus acridiorum* d'Herelle and on certain intestinal organisms of locusts (with J. Vanderleck). Ann. Ent. Soc. Am. X., 1917. The eye-spotted bud moth.—Ninth Rept. Que. Soc. Prot. Plants, 1917. On the structure and function of the proventriculus of *Gryllus pennsylvanicus*. Burm. Psyche XXV., 1918. The propleura and pronotal grilci of the orthoptera. Can. Ent. LI., 1919. On the muscular system of *Gryllus assimilis* Fab. Ann. Ent. Soc. Am. XIII., 1920. Studies on *Spirochaeta duttoni* in the tissues of its invertebrate host.—Ann. Trop. Med. & Hyg. Liverpool (to appear shortly). Reports and popular papers on injurious and beneficial insects, published in Repts. of Ent. Soc. Ont., Que. Soc. Prot. Plants, etc.

Horticulture. School Fair Work.—Distribution of potato, beet, carrot, bean, corn, tomato, and flower seeds to children in rural schools. Liberal packets or quantities of seed, sufficient to plant a plot of each were distributed to from 1,000 to 5,000 each year or until the work was discontinued two years ago.

Rural schools to the number of twenty have been provided with trees, shrubs, vines and perennials with a view to improving the school surroundings. One academy and several rural churches have been similarly provided with plants.

Three small demonstration orchards of fifty trees each were planted and of these two have done well.

A Skinner irrigation system of seven acres was installed for strawberries and vegetables. It has demonstrated its value under our climatic conditions on such crops as strawberries, celery, onions, early vegetables, etc. In some years irrigation applied in a period of a drouth has more than doubled the crop over non-irrigated plots. Irrigation has also demonstrated its value at transplanting time in giving plants a quick start and eliminating losses from drouth, etc. Applications of from one-half inch to one inch are usually given, depending on the crop. Three to six applications for the season are usually sufficient for most crops but in the case of melons, etc., more frequent applications are necessary.

A variety and strain test of onions and cabbage was carried on and completed. It has shown that much seed sent out was not true to variety or strain, was low in germination, and in other ways was of little value as compared to the best strains available. Probably the greatest improvement in crop yields could be brought about by the elimination of much of the worthless or inferior seed now on the market.

Field-spraying experiments on Fameuse apple orchards were carried on for several years.

Field experiments and demonstrations in the control of onion and cabbage maggots and onion smut.

Encouragement given in the cultivation of small fruits and vegetables, particularly among the returned soldiers who have settled on the land. Seeds, cuttings and plants have been distributed as nuclei. Small fruit plants were also sent to the Boys' Farm and Training School, Shawbridge, P.Q.

Collections of peonies and irises were obtained for the college campus.

Lectures, short courses and demonstrations have been arranged for at various points in the province, and judges provided for exhibitions and horticultural societies.

Equipment has been added to, particularly in lantern slides, and in spraying and dusting machinery.

Poultry. Since poultry raising is just as sound a business as any other branch of farming, and since the need for increased production of eggs and poultry meat is very great indeed, the efforts of this department have been concerned chiefly in the development of an efficient extension policy. The aim has been to make this department of the greatest possible service to poultry raisers. Several lines of extension work have been carried on, involving the employment of an extension poultry husbandman, chief among which are the following:—

The poultry department has worked through the rural schools to improve poultry raising conditions by encouraging the children to take an active interest in the work on the farms and at the same time giving the children an opportunity of doing some practical work in poultry production. From 1913 to 1920 inclusive the following numbers of settings of eggs from bred-to-lay strains were distributed free of charge: 100, 425, 610, 541, 658, 892, 740 and 750, making a total of 4,716 settings. Several hundred settings were also sold to the Quebec Department of Agriculture for distribution.

From 1913 to 1921 inclusive the following numbers of school fairs have been held:—3, 9, 14, 13, 21, 24, 25 and 32,

making a total of 141 fairs, for which judges were supplied free of charge for much of the judging work.

Fifteen demonstration flocks were selected as a source of supply for eggs for school fairs and as community breeding centres in the distribution of eggs from improved flocks in their various localities. These flocks have used for breeding purposes pedigree bred-to-lay males from this department. An inspection and culling of the flocks was made twice yearly.

Six demonstration houses were erected in 1913 in various parts of the province. Using these houses as models, a large number of houses have been built by farmers.

The amount of information and literature on poultry raising sent out has steadily increased.

Demonstrations and lectures have been given at meetings of poultry associations, women's institutes and farmers' clubs.

More recently special demonstrations have been given in fattening and preparing poultry for market. Birds have been fattened, killed, plucked and dressed under direct supervision and the supervisor has assisted in enabling many farmers to market their produce more efficiently.

With a view to conducting local culling schools in different parts of the province, demonstrations have been given in selecting layers and breeders. Assistance has also been rendered in marketing the culled stock.

Rural Schools. This department was organized in the spring of 1915. Its mission was to study rural conditions in the Province of Quebec, especially as they related to the boys and girls, and to follow up lines of work which would be of great value to the various communities.

At one time the appropriation of the department allowed the engagement of two men and provided for a fair amount of travel but now it is sufficient to support only one. However, it is consid-

ered, very decidedly, that the department has been able to help the people, especially the children, in the province, and that it has supplied and will supply, in part, a widespread want.

The summer months of 1915 were spent in a study of work done in the province of Ontario in connection with the enlargement and beautification of schools and school grounds, courses in agriculture, school garden projects and school fairs. In the fall some assistance was given the Macdonald College demonstrators with their school fairs. During the winter months a very extensive tour of lectures in agriculture was carried through in the intermediate and high schools in Quebec province. In the spring the grounds of several schools were improved with the planting of shrubbery and perennials.

In the spring of 1916 the Macdonald College demonstrators were withdrawn. From 1916 until 1921, the rural school department was, in reality, a special department for the organization and execution of school fair work among the English-speaking children of the province. The great value of that work was recognized and an effort was made to have it efficiently managed. As an evidence of its popularity, in 1918, almost 8,000 children received seeds and eggs and had the right to exhibit at some school fair.

In the fall of 1919, the Quebec Government, at its expressed desire, became responsible for the management of school fair work in all counties where it had agricultural representatives. Because of this, Macdonald College confined its efforts for the year 1920-21 to approximately 2,000 children and endeavoured to show still more clearly the wonderful possibilities in this work which seemed to be satisfying, in some measure, the hunger of the young people. During this year a large amount of time was spent in giving demonstrations and lectures in household science and agriculture to all the children interested in the

work. It was and is felt that this is a most necessary phase of the work if the children's efforts are to result in their rising above the level of the individual home. In September, 1920, nine extremely successful school fairs were held.

The purpose of the school fairs is to stem the flow of young people from the country. There are many sides to the needs of the people in the rural districts which are not agricultural and which a department of agriculture could not very well supply. What the people are hungering for is a true social life where their higher, aesthetic longings will be satisfied. All these lines of work could be embraced in the school fair programme, but much more sensibly under the auspices of a department of education than a department of agriculture. The people want music, supplied by themselves; they want a knowledge of individual and group athletic competitions; they want to be joined as units of the nation by means of the establishment of community centres; then, when they have these wants supplied they will lend a more attentive ear to the advice of our purely agricultural experts. Because of these findings the Macdonald College authorities advocated, during 1921, a change in the management of the school fair work in this province. They would like to see the work directed and executed by the two committees of the Department of Public Instruction.

During 1921 considerable time was spent in an effort to have the above-mentioned change in management of this work go into effect, but the effort was not successful due to scarcity of funds. The remainder of the year was used to experiment with several lines of community work to see how they would be received.

Veterinary Science. Instruction.—Instruction and practical work were given to the first, second and fourth-year classes in the school of agriculture. To the first-year students, a general introduction to the subject, principal

structures and functions of the animal body; to the second-year, a more advanced and practical course to familiarize the students with the common ailments of farm animals and the most modern methods of preventing same; to the fourth-year students, a special and more elaborate course was given so that they might become critical judges of live stock with regard to disease and develop sound judgment in handling sick animals; to the fourth-year, a course in contagious and infectious diseases, supplemented by two laboratory periods per week, covering a bacteriological study of organisms causing certain specific diseases and post-mortem examination of animals which have died of such diseases. To returned soldiers, under the Invalided Soldiers' Commission, and under the Department of Soldier Civil Re-establishment, was given, at Macdonald College, a simple practical course dealing with the common veterinary practice on the average farm.

Much work has been done and is being done in combating and controlling infectious and contagious diseases, as follows:—

Abortion, (a) advising owners as to care of cattle which have aborted; (b) treatment of sterile animals with success.

A treatment was devised for "calf diphtheria." This disease is found very frequently in the locality of Macdonald College and is attended by losses due to the stunting of growth of the individuals affected.

A severe outbreak of calf septicemia was also combated for a farmer in the eastern townships.

Lip and leg ulceration also made its appearance in this locality and was successfully dealt with.

Avian diphtheria was diagnosed and controlled in a large flock of poultry.

At the present we are investigating a disease which has caused the loss of numerous cows and calves on a farm in the eastern townships. We have been

able to discover the organisms causing the disease and the source of the infection. It remains that we should work out the details of the disease and a treatment for the same.

Extension.—Extension lectures were given in various parts of the province, under the auspices of farmers' clubs and breeders' associations, dealing particularly with tuberculosis, abortion, garget, etc.; inquiries were answered by mail, etc.

Research.—Assistance was rendered in connection with the bacteriological investigation of the milk supply of the city of Montreal, reported on in September, 1914.

Publications.—Articles in the *Journal of Agriculture and Horticulture of the Province of Quebec*:

A combined neurectomy hook and knife, *Vet. Journal*, London, September, 1918. A method of enucleating the eye, *Vet. Journal*, London, January, 1919. Pump attachment for record syringes, *Vet. Journal*, London, August, 1919. Surgical narcosis of horses by chloral hydrate given intravenously, *Vet. Journal*, London, November, 1919. Periodic Ophthalmia—A review, *Can. Vet. Record*, Toronto, April, 1920. Case Report—Malignant edema in an aged mare, *Cornell Veterinarian*, Ithaca, October, 1920, *Can. Vet. Record*, Toronto, November, 1920. Case Report—Traumatic Pericarditis in a heifer, *Cornell Veterinarian*, Ithaca, July, 1921; *Can. Vet. Record*, Toronto, March, 1921. Anaesthesia in general practice (an address), *Sci. Agri.*, Gardenvale, April, 1921.

School of Household Science

Work under the Agricultural Instruction Act was definitely undertaken in October, 1913. At this time a member was added to the staff of the school who should devote her whole time to extension work among the women in the rural districts of the province.

Prior to this date the women of several rural centres, with the assistance of members of the school staff, had organized eight clubs with aims and objects similar to those of the present women's institutes. During the first few months, through demonstrations and meetings held, interest grew to such an extent that in February, 1914, a conference of representative women was held at Macdonald College, a constitution drawn up, and the organization known as "Home-makers' Clubs," definitely launched. In 1919, this organization joined the federal organization, and changed the name to Quebec Women's Institutes.

A survey of the activities of the extension department shows that the growth of the work required the appointment of an assistant demonstrator in September, 1916. Work among the children of the rural schools developed in connection with the school fair movement, and, in November, 1918, a second demonstrator was appointed. Later the school fairs were largely taken over by the provincial government, and since July, 1921, the staff has consisted of only two permanent members. A Victorian Order Nurse, loaned by the Order during the autumn of 1921, lectured and demonstrated on home nursing, care of children, etc.

During the years from 1913 to January 1922, seventy-four Institutes have been organized in localities ranging from Megantic on the east to Pontiac on the west—the latter county having thirteen active clubs. The membership in June 1921, was 1321, and, in January, 1922, the number of active organizations is sixty-two—shifting population in scattered centres being chiefly responsible for the few disbanded. The territorial extent of the province necessitates extensive travelling, and organizations now planned for Montmorency and Gaspé will add greatly to the area to be covered.

That the organization of rural women was an important movement is evidenced in their activities. These dealt primarily

with the home, but have broadened out to embrace the school, the community and the State. Courses of study were planned by their director dealing with such subjects as cookery, sewing, laundry, household accounts, civics, economics, etc. Interest in school lunches and the feeding of children led to the placing of a school lunch equipment in many schools. Supplying milk, drinking fountains, musical instruments, shrubbery, prizes for competitions, and the improvement of grounds, are other benefits to schools. The care of cemeteries, assistance to hospitals, libraries and charitable institutions, providing healthful amusement for young people, and aid to, or the building of community halls are other common lines of work. Any worthy community object receives the support of the institutes. During the war, they were able to turn their attention to its needs, being already organized, and having received instruction in foods through the demonstrations and courses of study. To-day their interest in child welfare and better citizenship gives excellent promise for the future.

Each year, in June, a two-day convention of delegates is held at Macdonald College, when demonstrations and lectures are given, reports read and discussions held on matters of policy, and the problems of institute work. Seven such conventions have been held with an average attendance of sixty-seven. The College provides accommodation and the extension department defrays expenses of board, printing, speakers, etc.

From October, 1913, to January, 1922, the number of demonstrations in cookery, sewing, home nursing, etc., given to institutes, totalled 496. Demonstrations in cookery and sewing to pupils of rural schools 1916-1921—442; school fairs judged at during the same period, 104—the total number of judges supplied being 188.

Four travelling libraries of 35 volumes each were established in 1914 and

supplied free to institutes. These are in constant circulation.

A clipping library is maintained at the school for the institute members. It consists of 723 folders, and is in constant use.

Bulletins have been prepared and supplied as follows:—

Canning of Fruits and Vegetables, 5,500 copies; *Cookery*, 2,500 copies; *Sewing for Children*, 2,000 copies; *Saving of Meat and Wheat*, distributed during the war, and no record kept. In addition, 1950 commercial patterns have been supplied for sewing competitions.

Staff members have assisted with demonstrations and addresses at short courses held at Macdonald College and at other centres, meetings of farmers' clubs, housewives' leagues and other women's organizations. They have also carried on experimental work in cookery in preparation for bulletins, and given lessons and demonstrations to boy scouts, written articles on topics related to institute work for the *Journal of Agriculture and Horticulture of the Province of Quebec* and other publications.

Short Courses in Agriculture

During the first eight years (the ninth registration year not being as yet complete) that the Agricultural Instruction Act has been in force, all the short courses in agriculture held at Macdonald College and throughout the province have been financed under this Act. There has been a total of 410 students who have attended such courses held at Macdonald College, and an estimated attendance of 367 at the short course in Suburban Gardening, extending over four evenings, held at McGill University, Montreal, during the session of 1916-17. In the session of 1915-16, one-day short courses were held in live stock, field crops, poultry, horticulture, farm engineering and farm home at nineteen different centres of the farming community of the province. In all 52 meetings were held in 19 places, in 11 counties. Total attendance 2,371. Average attendance per meeting, 46. Thirty-six meetings were for men; total attendance, 1,740; average per meeting, 48. Sixteen were for women; total attendance, 631; average per meeting, 39.

SUMMER-FALLOW SUBSTITUTES

GROWING GRAIN IN ROWS

BY MANLEY CHAMPLIN, M.S., SR. PROFESSOR OF FIELD HUSBANDRY, UNIVERSITY OF SASKATCHEWAN

THE development of Saskatchewan has been based upon the production of wheat and oats. In order to conserve moisture and destroy weeds it has been the custom to summer-fallow once in two, three or four years, varying according to local soil and climatic conditions. This practice has usually proved profitable in the various districts as long as land was cheap and retained enough of its original fibre to prevent it from drifting, providing that the market prices of wheat and other grains were relatively high.

At the present time certain factors are operating to force a change in this scheme of operating a prairie farm. Just which of these is entitled to be called chief would be difficult to say, but each one exerts its influence towards a change. In many districts trouble is now experienced with soil drifting. The fallow lands are exposed to weathering for nearly a twelve month with the resulting movement of soil. The effects of drifting soil are so self evident that it is not necessary here to dwell upon them.

Market values of grain crops are no longer sustained by war inflation and it is necessary to cast about for methods by which to produce cheaply in order to compete in world markets.

Land values in some districts have advanced to a point where the interest and tax charges against a fallow acre for a year have become a real hardship to carry, often destroying all hope of profit in wheat production, or creating an actual loss to the grower.

Letter after letter and caller after caller coming to the Saskatchewan University Field Husbandry Department make statements which reduced to their

rows that can be used as a substitute for part of the fallow will be welcomed at this period in our agricultural history. Some are trying corn and others potatoes. These crops serve the purpose for a very limited acreage; but since corn is only dependable as a forage crop and potatoes do not find a ready market in large quantities at profitable prices, it remains for us to find something else that can be grown on a large acreage to replace a material percentage of the present summer fallow.

This leaves us the natural crops to which the province is best adapted; wheat, oats, barley and spring rye. Of



Summer Fallow Substitutes—Oats in Three-row Groups: Saskatchewan College of Agriculture.

briefest form can be summed up in the words, "*We must change our method of farming or give up.*" Most of them are not expecting to give up but are planning to work in certain adjustments or changes that will tend to insure the farm income and lower the cost of production of the chief market product, wheat.

Possible Fallow Substitutes

With this introduction it will be plain to all that any crops grown in cultivated

these four, oats has certain advantages as a cultivated crop. It is the chief feed grain crop and is used in large quantities as a hay crop, usually spoken of as "green sheaf feed." Therefore, if cultivation retards ripening or causes uneven maturity, the oats may be cut for sheaf feed without any considerable loss.

In order to grow grain crops in rows it is necessary to devise a special method of seeding but it is not necessary to buy a new seeder. The only new implement

required is a corn cultivator, and if one possesses a garden or one horse cultivator he can get along with that the first year or two while he is trying the practice on a small acreage.

How the Idea Originated

The idea of growing grain crops in rows and cultivating them originated during the season of 1911 while we were employed as cerealist at the Highmore experiment farm in South Dakota. During that year hot winds were so severe and continued over so long a period that all of the ordinary grain crops were destroyed. Our grain breeding nursery which was grown in rows 18 inches apart and kept cultivated to keep out the weeds was the only grain which headed out in that district. Gophers came in from the surrounding prairie in great numbers in search of green feed, and it was with the utmost difficulty that we were able to save any of our grain breeding nursery from their ravages. From this, some idea can be formed of the severity of the drouth and blistering hot winds which accompanied it.

A Russian agricultural commissioner by the name of Kol, who was then traveling in the United States, visited Highmore farm one day while we were engaged in cultivating a part of the grain nursery with a wheeled hoe or hand cultivator. When he noticed that the nursery grain was headed out and all the other grain crops were ruined, he asked why we didn't plant all of our grain that way. We told him that the cost of labour would absolutely prohibit that. He stated that much grain was grown in his home province by planting in rows far enough apart so that the women could walk between and hoe out the weeds.

We had long realized that in order to grow grain crops successfully in the central and western South Dakota, it was necessary to sow them on land that had been summer fallowed or which had produced an intertilled crop the year before.

Grain sown on corn ground which had been properly cultivated produced somewhat better than grain sown on summer fallow and rarely failed to produce a satisfactory crop while grains sown repeatedly by the ordinary method on the same land could be depended upon to fail three years out of five. At that time many farmers grew corn as a fallow substitute but very few grew enough corn to equal or balance their grain crops. This was particularly true in the northern half of the state. Some other fallow substitute seemed necessary. If the Russian method with grain crops could be adapted to machine culture, the problem would be well on toward solution. Single rows far enough apart for horse cultivation did not seem feasible so we tried double rows and triple rows spaced 36 and 30 inches apart respectively.

South Dakota Experience

All of the ordinary spring sown grain crops were given a trial for from five to seven years. The net result of these trials was that we found that all of the spring grain crops except flax responded nicely to cultivation. Oats and barley were especially good and wheat was satisfactory. Millet, proso and Sudan grass also were tried and found suitable for this method of culture. Thus our list of cultivated crops which formerly consisted of potatoes, corn and sorghum and garden stuff was expanded to include oats, barley, wheat, millet, emmer, proso and Sudan grass.

The effect of the cultivation of the grain or other crop in rows upon the succeeding crop was observed for seven years and no material difference could be noted; for example, between the wheat on corn ground, summer-fallow, potatoes or oats grown in rows. Owing to lack of available land and funds for investigation work it was impossible to lay out a new project in which a direct and absolute comparison of this kind could be made. We were therefore obliged to put in the row grain crops in connection

with our crop rotation project, and while we had ample opportunity for observation in a fairly accurate way, we had little opportunity to make strictly scientific comparisons of resulting yields of wheat or other grains following the various substitutes.

The detailed results of these investigations have never been published by the South Dakota Agricultural Experiment Station except in the case of Sudan grass and barley.* Under the rules of that station no results of experiments can be obtained for publication until after they have first been printed in an official bulletin. Hence we are unable to quote here actual results for wheat, oats, emmer, proso, and millet. The results with barley, however, are quite representative of those obtained with other grain crops. The tests at Highmore covered a period of five years, 1912 to 1917. The average yields were as follows:—

Ordinary drills, 6 inches apart	24.4
Drills 12 inches apart	22.5
Double rows—cultivated 36 inches apart	19.6
Triple rows—cultivated 30 inches apart	23.1

The grain was usually plumper and the quality better from the rows than from ordinary seeding, and the stubble of the row grain left the ground in such nice shape that discing and harrowing was sufficient preparation for the following crop, whereas the ordinary stubble had to be ploughed. The drill was set to sow at the same rate per acre in each case, namely, 1.5 bushels, but this reduced to 0.75 bushels for the 12-inch rows, 0.43 bushels for the double rows 36 inches apart and 0.64 bushels for the triple rows 30 inches apart.

Thus we were saving more than half on seed grain, were preparing the land better for the next crop, were producing

a better quality of grain and very nearly the same average yield by seeding in rows. In the seasons when moisture conditions were favourable the ordinary seeding yielded the best. In the dry seasons the rows yielded the best.

Sudan grass results are reported for two years, 1915-16, from five methods of seeding as follows in tons per acre:—

Drill rows 6 inches apart	2.84
Drill rows 12 inches	2.63
Drill rows 36 inches	2.14
Drill rows 42 inches	1.99
Double drill rows 36 inches	2.12

The rainfall was sufficient in both years of this test. The drill was set to sow half a bushel (25 pounds) per acre for the ordinary seeding and was left at the same set for seeding the rows, thus requiring 12.5 pounds per acre for the 12-inch drills, 4.1 pounds for the 36-inch drills, 3.6 pounds for the 42-inch single drills and 7.2 pounds for the 42-inch double drills.

The yield and quality of hay was better from the ordinary seeding than from the rows, but the land was left by the row plantings in a condition comparable to fallow. Sudan grass is a good annual forage crop for late spring seeding and the results given may be taken as quite representative of results obtained from millet and proso.

In the year 1915 we grew Kubanka wheat which gave the same yield per acre, namely 15 bushels, in triple rows 30 inches apart as was produced from ordinary seeding on a 50-acre field divided evenly.

Experiments at the University of Saskatchewan

With the experience quoted above to guide us, we determined to conduct experiments at Saskatoon to learn whether

*Champlin and Winright, S. D. Bul. 174, Sorghum for Forage in South Dakota, pp. 635-636.

Champlin, Morrison and Martin, S. D. Bul. 183, Barley Culture in South Dakota, pp. 65-67.

the practice of growing grain in rows as a fallow substitute would prove feasible here.

Preliminary experiments were instituted in 1921. The plots used were fairly large, 0.4 acre each. Very encouraging results were obtained. Wheat, oats and barley were included in the tests. Each crop was sown in two-row groups 36 inches apart and in three-row groups 30 inches apart. For comparison, yields are included for the same varieties sown in the usual way, as first and second crop after summer-fallow. The row grains were sown on land that had grown oats the previous year, 1920, and various crops in 1919 not having been fallowed since 1918.

The yields of grain in bushels per acre and straw in pounds per acre were as follows:—

MARQUIS WHEAT

Method of Seeding—	Grain	Straw
Ordinary, on fallow . . .	37.0	3,640
Ordinary, on fall ploughing	37.0	3,260
Double rows, 36 inches apart	18.5	953
Triple rows, 30 inches apart	22.1	1,115

BANNER OATS

Ordinary, on fallow . . .	83.5	5,220
Ordinary, on fall ploughing	60.0	2,720
Double rows, 36 inches apart	59.6	755
Triple rows, 30 inches apart	63.9	953

HANNCHEN BARLEY

Ordinary, on fallow . . .	59.2	3,220
Ordinary, on fall ploughing	56.5	2,460
Double rows, 36 inches apart	39.2	565
Triple rows, 30 inches apart	49.4	728

In 1922 Marquis wheat will be planted over all of this land and a plot of summer-fallow adjoining in order to secure a direct comparison of the effect of the grain crops in rows and summer-fallow upon the yield of wheat.

In addition to the experiment above noted, the Animal Husbandry department sowed oats in rows as a summer-fallow pasture crop with quite satisfactory results in 1921.

Further Investigation Essential

As will be seen from the foregoing, the preliminary trials with row grain have been encouraging, but further investigation is required to make certain of the chief points which remain doubtful, as follows:—

1. How will the yield of wheat after grain in rows compare with the yield of wheat on fallow or on corn ground?

2. Will the return from the grain in rows repay one for the extra labour required as an average for several years?

3. Will any difficulties such as slow maturing, lodging or rusting be found to be greater in producing grain in rows than in growing grain by the usual methods?

4. Will the stubble standing through the winter and the roots remaining in the soil in the spring help check soil drifting?

5. Will weeds in the rows give trouble on the average farm?

This year at the University of Saskatchewan a project will be undertaken to determine the effect of various fallow substitutes in the production of wheat outlined as follows:—

Oats in double rows	36 inches apart
Oats in triple rows	30 inches apart
Barley in double rows	36 inches apart
Barley in triple rows	30 inches apart
Wheat in double rows	36 inches apart
Wheat in triple rows	30 inches apart
Corn in single rows	42 inches apart
Potatoes in single rows	42 inches apart
Sunflowers in single rows	42 inches apart
Sudan Grass in double rows	36 inches apart

This series will be repeated in duplicate 0.05 acre plots, except the Sudan grass, and will rotate or alternate with wheat each year. Since results obtained at Saskatoon will not be convincing or

conclusive for other districts, it would be well if an experiment like this or very similar to it could be conducted at other experimental farms in the three Prairie Provinces. We will welcome any co-operation that may be had in giving the whole proposition a thorough trial.

We will also endeavour to secure 100 volunteers among farmers who will try

growing oats in rows as a fallow substitute. Thus any unforeseen difficulties that may be concealed in the future with reference to this method of culture will be brought out.

In this paper we have endeavoured to set forth a fairly complete résumé of the past, present and future as related to growing grain in rows as a partial substitute for fallowing.

WHEY BUTTER

BY H. H. DEAN, B.S.A., PROFESSOR OF DAIRYING, ONTARIO AGRICULTURAL COLLEGE

DURING the summer of 1921 a study of whey butter was made jointly by the Dairy and Bacteriological departments of the Ontario Agricultural College, and co-operatively with the Wisconsin Experiment Station at Madison. Altogether eleven sets of experiments were conducted, but bacteriological tests were made on but two lots—May 13 and 20.

The plan of the experiments was to mix in one vat all the milk received for cheesemaking for the day, which averaged about 1,500 pounds. Out of this was taken from 150 to 200 pounds milk, which was separated and the cream churned. The remainder of the milk in the vat was made into cheddar cheese in the usual way. The whey was run through either a Sharples or DeLaval whey separator. The whey contained from .2 to .3 per cent fat, averaging about .25, at the time it was removed from the curd, or at the stage of cheesemaking known as "dipping." Both lots of cream were cooled immediately after separating and were kept practically

sweet until churned next day. Part of the lots (May and June) were churned raw, and part were pasteurized. The average acidity of the milk cream at the time of churning was .24, and of the whey cream .2 per cent. The average churning temperature of the milk-cream was 54°, and of the whey-cream 52° F. The average time required for churning the cream separated from milk was 32.8 minutes; that for cream separated from whey was 22.4 minutes. The average tests of fat in the buttermilk were .55 and .89 respectively for the milk and whey cream lots.

Pound print samples of the first two tests were scored at the end of one week, and again at the end of one month, after holding at a temperature of about 45° F. in cold storage at the dairy. The remainder of the lots were packed in fourteen-pound boxes and sent to the Government grading station at Toronto where they were scored when fresh; and again after holding in cold storage for three to six months. The average of all scores of butter were:—

	Cream Separated from Milk		Cream Separated from Whey	
	1st Score	2nd Score	1st Score	2nd Score
Flavour (Max. 45)	38.13	37.09	37.77	36.73
Total (Max. 100)	92.09	90.96	91.75	90.69

The average difference in the first and second scores for flavour was .36 point in favour of the lots made from separated milk. Each lot lost 1.04 points in flavour during the time it was held in cold-storage, and both lost practically the same number of points in total score. There was practically the same relative

differences in flavour between the raw and pasteurized lots, both when fresh and after holding in cold-storage, in the case of butters made from separated milk-cream and whey-cream.

The following bacteriological data has been furnished by Professor T. H. Lund:—

SAMPLES TAKEN MAY 13 AND 14

Acidities	May 13 samples		May 14 samples
	When fresh	24 hrs. at 25° C.	When churned
Milk	0.20	0.88	...
Milk-Cream	0.16	0.48	0.36
Whey	0.17	0.54	...
Whey-Cream	0.16	0.40	0.30

Figures indicate percentage of acidity calculated as lactic acid.

Bacteriological Counts	May 13 samples		
Milk	2,800,000		
Milk-Cream (40% Fat)	42,000,000		
Whey	8,400,000		
Whey-Cream (38% Fat)	43,000,000		

	May 14 samples			
	Bacteria	Yeasts	Oidium	Penicillium
Milk-Cream	125,000,000	1,500	170	1
Milk-Cream-Butter	6,000,000	380	35	11
Whey-Cream	85,000,000	120	1	14
Whey-Cream-Butter	5,000,000	100	0	11

Figures indicate colony count per gram of milk, whey, cream or butter.

SAMPLES TAKEN MAY 20 AND 21

Acidities	May 20 samples		May 21 samples
	When fresh	24 hrs. at 25° C.	When churned
Milk	0.24	0.78	...
Milk-Cream	0.18	0.57	0.30
Whey	0.18	0.48	...
Whey-Cream	0.17	0.48	0.20

Figures indicate percentage of acidity calculated as lactic acid.

Bacterial Counts	May 20 samples		
Milk	19,000,000		
Milk-Cream (34% Fat)	54,000,000		
Whey	35,000,000		
Whey-Cream (31.5% Fat)	40,000,000		

	May 21 samples			
	Bacteria	Yeasts	Oidium	Penicillium
Milk-Cream	209,000,000	270	6	12
Milk-Cream-Butter	2,050,000	30	0	27
Whey-Cream	113,000,000	200	150	9
Whey-Cream-Butter	1,600,000	90	1	26

Figures indicate colony count per gram of milk, whey, cream, or butter.

"One point brought out by the above figures is the slower development of acidity in the whey and the whey-cream, compared with that in the milk and the

milk-cream. This is probably due to the removal of certain constituents from the milk and cream during the cheesemaking process."—Professor Lund.

Conclusions

1. A very fair quality of butter can be made from whey-cream, which compares favourably, when fresh and when held in cold-storage, with butter made from similar cream that has been separated from whole milk. Because of the small quantities of milk and whey we worked with, the quality of the butters was not so good as if larger volumes had been handled.

2. The differences in bacterial content between milk, cream, and whey-cream were not constant. The whey-cream butters were lower in bacterial count than the butters made from milk-cream.

The yeast and mould counts were not consistent, though the tendency was for higher counts in the milk-creams and milk-cream butters, as compared with the whey lots.

3. It pays to separate the whey at a cheese factory where there are 5,000 to 6,000 pounds or more of milk received daily throughout the summer season.

4. The keeping quality of whey-cream butter in cold-storage appears equal to that made from milk-cream. The average of the scores for texture of the lots made from milk-cream was 14.37; and of the whey-cream lots 14.35, indicating very little difference in this respect.

PROGRESS OF SEED POTATO CERTIFICATION IN BRITISH COLUMBIA

BY C. TICE, OFFICER IN CHARGE

THE results obtained from the first season's work in the inspection and certification of potatoes in the province of British Columbia have been satisfactory and encouraging. Eighty-nine growers, in nine districts covering a total area of 195 acres, received inspection of their crops; 175 acres passed the first field inspection and 157 acres passed the second field inspection. One tuber inspection was made after harvest and before the crop was graded, and a second tuber inspection is to be made this spring just prior to shipping.

The success so far of this work has been due to the fact that we have received the full support and co-operation of the growers. Every district that intended taking up the work on a large scale, formed a local potato-growers' organization, if one did not already exist in that particular locality. By this means, it has not only been possible to call the growers together whenever occasion warranted, but also to start each district growing one or two standard varieties.

The seed used as foundation stock varied somewhat in quality, although it had all been carefully selected. As no certified seed potato work had been carried on in this province prior to the season of 1921, there were two courses for the growers to follow in order to obtain good foundation stock. First, to use the best of local seed or, second, to import certified seed. On account of the season being somewhat advanced when some of the districts decided to take up the seed certification work, it was not possible to bring certified seed into those districts. Other districts because the cost of importing certified seed was very great, did not feel disposed at a time when conditions generally were not the best, to purchase imported certified seed. Growers in the Ellison district, near Kelowna in the Okanagan Valley, through the efforts of some of its more enthusiastic farmers and the assistance of the local bank, were fortunately able to purchase a carload of Minnesota certified seed potatoes. The car arrived at its destination in first class condition and

some of the very best potatoes imported into British Columbia, were shipped in at that time.

Districts that had to resort to the use of local seed for foundation stock secured the very best possible by selection of the tubers only. It was, of course, not possible to select seed free from leaf roll and mosaic disease, since neither of these diseases appear on the tuber. However, the results of our field inspections

last summer clearly showed that the amount of leaf roll and mosaic disease present in the seed was comparatively small.

The following table shows the source of seed, varieties grown, average percentage of leaf roll and mosaic diseases respectively; also the number of fields inspected in various districts during the season of 1921:—

District	Variety	Number of fields inspected	Source of seed	Average per cent leafroll	Average per cent Mosaic (severe)	Average per cent Mosaic (slight)
No. 1.....	Netted Gem.....	3	Imported Certified	.....	.....	.....
" 1.....	Irish Cobbler.....	11	"	.25	.....	.....
" 1.....	Green Mountain.....	10	"	.....	.....	.....
" 1.....	*Unknown.....	1	local	3.00	10.00	.....
" 2.....	*Unknown.....	1	local	50.00	.....	.....
" 2.....	*Mortgage-lifter.....	1	local	10.00	.....	.....
" 3.....	Burbank.....	5	local	.....	.....	1.12
" 3.....	Up-to-date.....	8	local	.48	.25	.25
" 4.....	Jersey Royal.....	6	local	.31	.50	1.41
" 4.....	Netted Gem.....	20	local	.41	.....	.57
" 5.....	Gold Coin.....	1	local	.....	.....	.....
" 5.....	Jones' White.....	1	local	.25	2.00	4.25
" 6.....	Sir W. Raleigh.....	5	local	2.89	.25	.25
" 6.....	Carmen No. 1.....	1	local	1.00	.....	.....
" 7.....	Up-to-date.....	3	local	1.16	.....	2.50
" 8.....	Up-to-date.....	2	local	2.85	1.00	1.75

*Fields planted with common stock and therefore not entered for seed certification purposes.

From the above table it will be observed that leaf roll and mosaic diseases do exist in British Columbia but in very small amounts. The value of the very best potatoes for seed purposes is clearly brought out by the small percentage of disease found in District No. 1.

The future for seed potato certification is bright. Through the assistance of an increased appropriation for this scheme for the season of 1922, it is hoped to extend the work to several new districts. Applications for inspection and requests for meetings to discuss the situation have already been received from twice as many districts as last year. One new district has twenty-five growers who desire to take up the seed potato certification work. We are not encouraging districts to take up this work on a large

scale to start with, but rather to start in a small way and do the work thoroughly.

Number of Inspections

The following inspections will be made in connection with seed potato certification work in this province in 1922:—

(a) *Early Summer Inspection of Field.*—This will be made at bloom-time.

(b) *Late Summer Inspection of Field.*—This will be made as nearly as possible four weeks after bloom time inspection.

(c) *After Harvest Inspection.*—This will be made before the crop is graded.

(d) *Shipping Inspection.*—This will be made after the crop is graded and immediately prior to shipping.

STANDARDS FOR INSPECTION
FOR 1922

I. FIELD INSPECTION

(A) *First Field Inspection* (Early Summer):—

Foreign (impurities)—Not more than 5 per cent will be allowed.

Curly dwarf leaf roll mosaic.—Not more than 5 per cent of the combined diseases will be allowed.

Wilt—Not more than 3 per cent will be allowed.

Blackleg—Not more than 2 per cent will be allowed.

At this inspection the presence of rhizoctonia, and early blight, also the degree of severity of attack by these diseases will be noted.

(B). *Second Field Inspection* (Late Summer)

Foreign (impurities) Not more than 2 per cent will be allowed.

Leaf roll curly dwarf mosaic—Not more than 2 per cent will be allowed for combined diseases.

Blackleg wilt—Not more than 2 per cent of the combined diseases will be allowed.

At this inspection the presence of late blight, and rhizoctonia, also the degree of severity of attack by these diseases will be noted.

N. B. Roguing must follow each inspection. In view of the fact that leaf roll and mosaic diseases may be transmitted from diseased to healthy plants by insects during the growing season, it is desirable for growers not to wait for advice from the inspector before rogueing their crops. Roguing should be carried on regularly throughout the entire growing season.

II. TUBER INSPECTION

Rhizoctonia—Not more than 10 per cent of slight rhizoctonia will be allowed.

Not more than 3 per cent of severe rhizoctonia will be allowed and no scurf spot larger than one-eighth inch in diameter will be allowed.

Occasional spots will constitute slight rhizoctonia.

Stem end discolouration:—Not more than 3 per cent will be allowed.

Late blight or dry rots—Not more than 2 per cent will be allowed.

Powdery scab—No severe powdery scab will be allowed.

Not more than 1 per cent slight powdery scab will be allowed.

Occasional spots will constitute slight powdery scab.

Common Scab—No severe common scab will be allowed.

Not more than 5 per cent of tubers with slight common scab will be allowed.

By severe common scab is meant infections—

(a) covering more than 5 per cent of surface of tuber,

(b) taking the form of cavities.

Net Necrosis—Not more than 5 per cent allowed.

Internal brown spot—Not more than 3 per cent allowed.

Silver scurf—Not more than 5 per cent allowed.

For the combined diseases, late blight or dry rots, stem end discolouration, rhizoctonia (severe), not more than 2 per cent will be allowed. For the combined diseases, late blight or dry rots, stem end discolouration, rhizoctonia (severe), net necrosis, internal brown spot, silver scurf, not more than 5 per cent will be allowed.

For the combined diseases, late blight or dry rots, stem end discolouration, rhizoctonia (slight) and common scab (slight) not more than 7 per cent will be allowed.

For the combined diseases late blight or dry rots, stem end rot or discolouration, rhizoctonia (slight), common scab (slight), net necrosis, internal brown spot and silver scurf, not more than 10 per cent will be allowed.

GRADING

Certified seed potatoes should conform to desirable commercial grades. The following grading regulations must be strictly observed.

(1) Potatoes shall not be less than 3 ounces or more than 12 ounces in weight, where one grade is made. Those growers who desire to make two grades: one to supply those who plant small whole seed, and the other to supply those who plant cut seed, will be allowed to use 2 ounce potatoes in their small whole seed grade.

(2) Potatoes shall be of good appearance and reasonably true to type, shape, colour and general appearance and shall not be mixed with potatoes of other type or types.

(3) Potatoes shall be practically free from second growth, growth cracks, bruises, cuts, badly skinned potatoes, or injuries from other causes that are likely to cause rot.

(4) Potatoes shall be practically free from dirt or other foreign matter or damages caused by mechanical means.

A tolerance of 5 per cent by weight is allowed for the above combined defects.

(5) Potatoes shall be free from soft rots of all descriptions and from frozen tubers.

Growers whose crops are passed as certified seed will receive both a certificate and tag; the latter to be attached to each sack available for sale by the inspector or some other duly authorized person at the time these potatoes are about to leave the hands of the growers. The certificate will be issued after the final inspection.

General Recommendations

Growers should adopt up-to-date methods throughout the whole season in order that their crops may reach the required standards.

Although seed disinfection and spraying are not compulsory measures in the growing of certified seed potatoes, nevertheless all growers are advised to disinfect their seed before planting and to spray in those districts where spraying is advocated by the Department.

PART III

Agricultural Education and Related Activities

AGRICULTURAL EDUCATION IN ONTARIO

Progress in Schools Below College Grade

BY DR. J. B. DANDENO, INSPECTOR OF AGRICULTURAL CLASSES

DURING 1921, in Ontario, continued steady progress is apparent, especially in the Public and Separate schools, not only in number of schools undertaking to give regular instruction in agriculture, but also in the character and usefulness of the work. These agricultural educational activities which are under the direction and control of the Department of Education fall into four classes:—

- (1) Public and Separate Schools,
- (2) High Schools, Continuation Schools and Collegiate Institutes,
- (3) Normal Schools,
- (4) Summer Courses in Agriculture for teachers.

The progress of this work in the Public and Separate schools is shown by the fact that, though the introduction of Agriculture as a school subject is optional, there were close to 2,000 schools with classes in agriculture in 1921. In 1920 there were 1,648 such schools. This number includes both urban (graded) and rural (ungraded) schools. Close to 25,000 pupils in these schools received instruction in agriculture in 1921. About two-thirds had school gardens. The grants to boards and teachers of the Public and Separate schools are based upon the school year. For the high schools the grants are based on the calendar year. In 1921 there are thirty high schools maintaining classes in agriculture and four Public schools with fifth forms. Of the high schools three

carry on "Departments" of Agriculture which are semi-vocational. Practically all of these schools have plots of land, owned, rented or obtained free. In the high schools about 1,000 pupils receive instruction in agriculture.

Regular instruction in agriculture is given to the teachers-in-training in the Normal schools with some practice in the management of school plots. In 1920-21, about 1,330 students received such instruction.

Financial assistance is given by the Department of Education in the form of grants to the board for equipment and a small grant to the teacher. In the school year of 1919-20, \$61,750 was paid out for this. In 1920-21 it will require about \$80,000. None of this money is used for building or for accommodations, nor yet for prizes either in connection with school fairs or otherwise. The teachers of the Normal schools receive no agricultural grant.

The Summer Courses in Agriculture for teachers are now held at three centres—the Ontario Agricultural College, Guelph; the Ontario Ladies' College, Whitby; the Northern Academy, Monteith. In 1921, 524 teachers attended these summer courses at these centres at an expense to the Department of Education of \$23,141.89 for board, lodging and travelling expenses, and \$10,375.75 for instruction.

SUMMARY

The Department of Education paid out in 1920 approximately as follows:—	
Public and Separate Schools ..	\$ 77,000 00
High and Continuation Schools.	14,131 60
Summer Courses—	
Instruction	9,910 00
Refund of expenses	22,842 00
Salaries and travelling expenses.	4,200 00
	\$128,083 60

Federal Assistance

The amount received from the Federal appropriation under the Agricultural

Instruction Act was \$40,000, which was less than one-third of that required to carry on the work. The figures for 1921 are not yet complete, but it is quite likely they will reach \$150,000.

From the Federal appropriation referred to above, the province of Ontario receives annually \$336,274.96, so that the Department of Education receives only about one-eighth of the money appropriated for Ontario.

THE SCHOOL IN THE RURAL COMMUNITY— *Concluded*

BY G. V. VAN TAUSK, M.A., B.Sc. (OXON), B.S.A.

Some of the Practical Work

The practical work of the schools can be divided into—

- (a) Home projects;
- (b) Booklet work;
- (c) Correlation with regular school subjects;
- (d) The teaching of agriculture, manual training, or domestic science, *per se*;
- (e) Work done by the school for the community;
- (f) Boys' and girls' clubs;
- (g) Community work.

Home Projects.—In many States of the Union and in some of our Provinces it is now becoming the practice to give credit in school for certified work done at home. Such home work as the teacher is qualified to supervise should receive her attention. Suitable home projects are potato growing, poultry keeping, simple gardening, home reading, the rearing and care of pets, the rearing of pigs, beautifying the home grounds, canning of fruit and vegetables, needlework, etc. There is no teacher, however poorly qualified, who cannot fit herself in a short time to give instruc-

tion and direction in some form of useful home work. The influence of the school must reach the place where the training is to take root, and that is the home and the farm. In the writer's opinion, the proper use of the home farm for purposes of practical work and instruction can be made to yield results superior to any that can be obtained on school property. The best example of what can be accomplished in this manner is the Massachusetts Home Project Plan. In that State this method of instruction is made the basis of government grants. There are two distinct parts to this project plan. The first is the productive work supervised by the instructor; and the second is study directly related to that productive work.

Another interesting phase of this plan is that the boy or girl is not only doing while learning, but earning. This combination of earning, doing and learning will solve the difficulties in connection with keeping children in school. Considered from every point of view, the success of the home project plan depends on careful supervision, but if such exists it offers great possibilities in agricultural education.

Booklet Work.—It is a good plan to make illustrated booklets telling the story of work done at home or in school. This gives the pupil a chance to put what he has learned in a permanent, attractive form and to open an avenue for originality. It combines work in planning and execution, investigation, selection, English, art, penmanship, review, accuracy, system, and condensation, and calls for the exercise of judgment all along the way. Professor Benson says: "I think I have never undertaken any one scheme in agricultural educational work fraught with so much significance."

The pupil should start booklets on plants, seed selection, animals, hobbies, or what not. They may be most of the school year making the booklet, but whenever they get a page good enough to keep, they should have a place in which to keep it. The booklets may contain the history of the plant, its value for food, how to breed it, how to cook and prepare it, and how to keep it. Covers may be made for the booklets as part of the work in drawing. The farm journals, the catalogues of seed houses and the nurseries furnish illustrations, pictures, letters for lettering, and valuable suggestions for such matter. These booklets, when finished, should be marked and judged, allowing 20 per cent each for the following: Contents, neatness, originality, amount, arrangement. The great advantages of the booklet method in instruction are: First, pupils like to do the booklet work. Second, the making of the booklet helps to crystalize the pupil's knowledge. Third, each pupil works by himself and on a subject in which he is interested. Fourth, booklets are really permanent notebooks. The home folks like to see the systematized, clearly and definitely expressed knowledge of the child in attractive, permanent form. Fifth, each child likes to make collections and investigations even with the least of direction. The information gathered by any one child should become

the common property of all the children of the school. Incidentally, this method of teaching is a very good introduction to the more formal study of Nature Study, Agriculture and Domestic Science.

Correlation With Regular School Subjects.—The agricultural, domestic science or any other practical work done in the school should always be the basis of the other school subjects, reading, language, arithmetic, spelling, etc.

Supplementary Reading. For supplementary reading use Dominion and Provincial bulletins. Have pupils read for the thought on the printed page. Have them make both oral and written reports. Have them learn poems relating to agricultural subjects. Let them read those parts of books treating on the topics under discussion.

Grammar and Composition. Have oral discussions on field trips. Write neat reports. Save some of the better pages for booklets. Pay particular attention to neatness, spelling, grammar, punctuation, capitalization, paragraphing, etc. Take time to call attention to new words when introduced.

Arithmetic. Measure fields, buildings, bins, hay-stacks, yards, posts, distances between posts, etc. Calculate costs, capacities, values, etc. Supplement arithmetic with problems that are coming up at home. Collect problems on farm management. Use figures that represent real farm conditions.

Geography. Geography of the school district, latitude and its connection with the crops being grown, weather and its influence on agriculture, climate as it affects what can and what cannot be grown, number of days' work in the year, history and civics. Study the relation of industries and inventions and the development of the country. Have pupils make, as part of their booklet work, historical studies of various crops, animals and plants in the district. Make a study of transportation, history, problems, etc. Make a study of the influence of good

roads. Study road laws, weed laws, land surveys, the history and influence of the Mounted Police, food and seed laws.

Physiology. Study farm products as food and their relation to diet. Call attention to similarity of structures and diseases of farm animals and people. Discuss creameries and care of food as a hygienic matter and as a business matter. Study sanitary and hygienic relations to home and farm conditions, equipment, activities, etc.

Drawing and Writing. Draw the whole or parts of plants, animals and objects being studied. The aim should be to represent just what is seen by study of the actual object. Draw maps of farms to show layout, rotations, etc. Be sure not to accept any pages for booklets unless well written.

Music. Have pupils learn songs that pertain to rural life as "Queen Autumn," "The Farmer," "Song of the Harvest," etc.

Industrial Work. Have pupils make a germinating box, garden devices, handy articles, etc.

As it can be seen, a correlation of studies as outlined above will cut down the time required for the formal teaching of the subjects of agriculture and other practical work to the minimum, give just as much useful information and have the same educational value.

The Teaching of Agriculture, Manual Training, or Domestic Science, per se.—As a formal school subject, it is an open question in the minds of many of our old-fashioned educators whether agriculture, or domestic science, or any other form of practical work can be legitimately placed within the public school curriculum. It may be pointed out that wherever introduced and handled by properly and specially trained teachers, it has proved a success. In the Province of Alberta it was not a success due mainly to its having become a text-book subject instead of a practical one, and also due to the lack of preparation of the teachers. The

curriculum is being changed so as to make agriculture a teachable subject and facilities are being given for teachers to acquire the necessary training. It is hoped that with the coming of a new government, which draws its strength from the rural communities, more emphasis will be put on the teaching of these subjects in the public, and especially, rural schools. It may be strange, but with the one exception of the Province of Alberta, every province in the Dominion and practically all the States in the Union have officials whose duty it is to help, assist, supervise, guide, etc., in elementary agricultural education. Their office is an Information Bureau for teachers. They are the connecting link between the educational authorities and any outside agency concerned with agriculture or rural betterment. There is an absolute necessity for such an official in Alberta, and not until we have such can we hope to have agriculture successfully taught as a formal school subject.

Work Done by the School for the Community.—There are several types of school activity which may be of a direct, economic benefit to the children's parents in particular, and the community at large in general. In this connection may I mention that, when a student at some State agricultural college, Professor Holden made the casual remark that he would make two ears of corn grow where only one grew before. His prophecy came true. On the same acreage the corn crop of the State of Iowa has been doubled and this was almost entirely due to seed judging and testing, introduced through and done by the public schools of that State. In Alberta there are four activities of a similar nature, to wit: Milk testing for the purpose of keeping cow records; seed grain judging; potato selection; and egg candling and grading. When we suggested these activities to the director of the Summer School he immediately fell in with the idea and

hence a great deal of our time in the agricultural course of the Summer School is taken up with these matters. These activities lend themselves admirably as contact points between the home and the school. One cannot in a short space of a lecture go into details of the methods to be used, but even if you have not taken a course in the above, very good bulletins are published on all of these subjects.

Boys' and Girls' Clubs.—The boys' and girls' club movement is well established in this province and is done under the direction of the Department of Agriculture. The results of the efforts of the club members are usually exhibited at the school fairs. However, in very many instances there is not sufficient co-operation between the school work and the club work. The starting point for club activities should be the rural school. The teacher has to be the guide. Another difficulty often met with in connection with club work is the lack of a definite system in judging the work of the members. The following tables are intended for guides to show the value of the various phases of the work. Take for instance a girls' garden and canning club:—

Age:	10 to 18 years, inclusive.
Acreage:	One-tenth acre, chiefly such vegetables as can be canned.
Basis of Award:	Points
1. Quality	20
2. Quantity (total lbs. of vegetables harvested and used) . . .	20
3. Variety of canned products . . .	20
4. Profit on investment	20
5. Written history on "How I Made My Vegetable Crop" . . .	20
Total score	100

Boys' and Girls' Potato Club:	
Age:	10 to 18 years, inclusive.
Acreage:	One-eighth acre.
Basis of Award:	Points
1. Greatest yield per one-eighth acre	40
2. Best showing of profit on investment	30
3. Best exhibit of one peck of seed potatoes	15
4. Best written history on "How I Made My Crop of Potatoes"	15
Total score	100

The personal touch in an association should not be under-estimated and hence the teacher when possible to do so should have a club leader come to her school and talk not only to the children but, wherever possible, to their parents and the ratepayers in general. The line of work to be taken must be considered carefully. Then the question of how many clubs, whether one for both boys and girls, or one for boys and one for girls, must be decided. Age, ability, local conditions and things of importance in the community all have to be considered. It is important in so far as possible that all pupils of the school should take part in some club. It came within our observation that clubs are a great factor in keeping boys in school. A Russian boy of our acquaintance had decided to quit school when his teacher organized a poultry club. He changed his mind and became one of the most interested and loyal members of the club and, incidentally, remained in school up to and including the eighth grade. This is by no means an isolated case.

Community Work.—Foght says: "The new conception in education is to so organize the schools as to reach all the people who need inspiration and assistance to surmount the high and difficult places in life and thereby extend to them the real blessings of a democratic government."

Does our present-day rural school offer reasonable hope of performing the task assigned to it above? Every teacher, yes, every citizen, should be interested in this question and know where improvement can be made. Obviously, the school is the educational centre of the community, but in most instances only for those members of the community between the ages of six and fourteen, but education is a process which lasts all through life and all educational measures which require special building, an organized centre, and expert guidance should find their home in the rural school. Continuation classes for use above fourteen years of age, night

classes, short courses, women's institute meetings, etc., should be in the school, and the teacher should be an integral part of these organizations. The school is also, or rather, should also be a social centre. It usually is centrally located, and if movable desks are installed makes an ideal place for the social gatherings of the community. Church services may be held there, harvest festivals, farmers' meetings, dances, or what not, and the teacher in order to do really worthwhile work should take a part in all these functions and activities. When teaching in a French-Canadian community in Manitoba, we closed our school to attend baptisms, weddings and funerals, and we thoroughly believe that by doing so we became part of the community to such an extent that we had the hearty co-operation of the ratepayers in improvement which we suggested for the school.

Another community activity that can be done by the school and which usually creates a great interest in the home, and also is of great value for the growing-up generation, is the study of country houses and country homes. Such topics as the country home and the country woman, beauty in the country, landscaping, gardening, sanitation, labour-saving conveniences, food for the country home, farm planning, should be treated when the occasion arises. An interesting and instructive activity for the scoring of country houses and country homes is on the following plan:—

Country House Score Card—	Points
Plan	35
Exterior appearance	25
Interior equipment and furnishings	25
Setting arrangements of paths and gardens	15
Total score	100

Country Home Score Card—	Points
1. Beauty	10
2. Wise expenditure of money	15
3. Sanitation	20
4. Modern conveniences	15
5. Labour-saving machines	10
6. Food	30
Total score	100

If a teacher has time and inclination to score the homes of his community in the above manner and put the result of his investigation at the disposal of the proper authorities, he will have done a great deal in adding to the existing store of knowledge which may be utilized in solving the rural life problem.

General.—One of the problems that the teachers meet with very often is the sequence in which to teach agricultural subjects. The following is suggested:—

FALL

- (a) Seed Selection, Insects, Birds, Weeds, Housing Farm Crops and Animals, Feeds and Feeding.
- (b) The Plant, Plant Breeding, especially Hill Selection of Seed Potatoes. Stock Judging, Grain Judging, Fitting for Shows.

WINTER

- (a) Care of Farm Animals, Ventilation, Dairying, Field Management, Crop Rotations, Drainage.
- (b) Farm Accounts, Farm Machinery, Seed Testing and Analysis, Soils, Conservation of Moisture, Fertilizers, Landscaping, Birds, Weeds.

SPRING

- (a) Planting and Cultivating, Farm Crops, Poultry, especially Care of Young.
- (b) Flies and Mosquitoes, Gardening, Fruit Growing, Insects. If necessary, use (a's) for a first-year course and (b's) for the second year.

Lesson Plan.—There is no place within the scope of a short paper to give definite lesson plans, but the following points must always be kept in mind: Preparation, presentation, comparison, generalization and application. To give an example, the lesson is Hen's Eggs:—

To learn how to breed hens for more eggs.—The preparation will consist in showing that our hens lay on the average only 80 eggs per year and they could lay between 170 and 200.

The presentation would have reference to the egg-laying breeds, their method of housing, care, feeding, trap nests, etc.

The comparison would refer to the trap-nest method and the ordinary method used to the use of male birds from egg strains and common strains.

The generalization: There are two methods of breeding. First, the trap-nesting and second, using the male from trap-nested stock.

Application: Read to learn if there be a still better method. Visit a poultry plant, or still better, take charge of part of the poultry flock at home for a home project.

Conclusion.—Obviously, there are a number of other factors which should enter into the solution of the country life problem, but sufficient data was given to show that there is a country life problem and also that the rural school can greatly assist in solving it. To a very great extent the three factors of solution, knowledge, education and organization, can be carried on by teachers using the rural school as the centre

of their activities. The time must come when we are going to educate to the farm instead of from the farm. This must be pre-eminently the work of the rural teacher.

We have no doubt in our mind that should even a part of the above outline be intelligently followed in any school it will greatly add to the life of the children, and we are satisfied that if the general public and the rural community especially would pay as much attention to the education of their children for rural life as they pay to economic betterment, Alberta would become the premier province of the Dominion in rural contentment.

May it be pointed out that agriculture and all the practical in education must first be taught by effective correlation rather than by general lessons in the daily class work. The famous anecdote told about Abraham Lincoln in relation to the farmer boy applies even more to the rural teacher. Lincoln was asked by a farmer friend of his who had five sons what he should make of them, to which he immediately replied, "Keep the smartest boy on the farm and let the rest of them study law." May I paraphrase this by saying, "Keep the most enthusiastic teachers in the country and let the rest of them teach in the city schools."

THE SCHOOL EXHIBITION—WHEN AND WHERE

IN submitting the following article Mr. J. W. Gibson, Director of Elementary Agricultural Education for British Columbia, advances the opinion that the time has arrived for making the School Fair a permanent institution, linked throughout the year with the regular school programme. It should no longer be regarded, he says, as 'a fetching school stunt,' but rather as the culmination of a sequence of studies conducted under the direction of modern

educationists. The question then presents itself as to whether the logical time for holding the Fair would not be at the end of the school year's work in June and before teachers and pupils disband.

Mr. Gibson made the suggestion that an expression of opinion on this matter might be secured from those who were associated with school fair work in other provinces. A number of authori-

ties have contributed their views on the subject, and their articles follow in succession.

It will be noted that in British Columbia the School Fair constitutes a feature of the regular Fair, whereas in Ontario and in most other provinces it is usually a separate and distinct institution, and that behind the teacher stands the agricultural representative, the school inspector, the rural education association or some other equally efficient organization.—*Editor.*

IN British Columbia, School Fairs are usually held in conjunction with the regular fall fairs, all details as to prize lists, staging of exhibits and judging of the same being in the hands of a teachers' committee representative of the district. In most cases the teachers are also represented on the Board of Directors of the Agricultural Society under whose auspices the fairs are held. Practically all of the fifty odd fairs held in the province last year included school children's classes, and in quite a large number of cases the school exhibits formed one of the greatest attractions. In some instances the chief difficulty has been in connection with the securing of suitable and adequate accommodation for the large volume of exhibits sent by the schools. At Chilliwack, for example, the Agricultural Association has found it necessary to provide two new buildings—one last year and another this year, chiefly on account of the ever increasing number of entries in the schools' section. The teachers and pupils of the city and district helped to meet the cost of these buildings.

In the main the Boards of Fair Directors in British Columbia have been thoroughly alive to the importance of the school fair, both from the stand-point of educational values and added attraction and general interest.

In one of the leading agricultural districts the teachers are now consider-

ing a plan whereby they will put on a school fair towards the close of the school year—probably about the middle of June. Such a fair, they believe, held at this time would have certain advantages, and would help to get over some of the practical difficulties which always have to be reckoned with. There would not be the same crowding of exhibits and the consequent lack of suitable arrangement which so often exists when school exhibits are housed in the same building with general fair exhibits. The teachers would all be on hand to organize the school fair with the pupils whom they had been teaching during the year. At present many new teachers take office at the beginning of the school year in September and are not in a position to give much assistance in planning and carrying out a school fair almost immediately after taking up their new duties. In June the pupils are still in the classes which they have been in during the year, so that it appears the logical time for the exhibiting of school work. The school fair, when held in June, would help to constitute an objective towards which teachers and pupils would work during their year together. In this way the school fair would have increased educational value and would more fully reflect the real character and extent of the school work for the year, not in one or two special lines as is so often the case, but in all subjects and departments of school activity. It would become a real parents' and children's day. The children and their exhibits would not become so much submerged in the crowding and the general hub-bub of the general fall fair. If the school fair were held on the school grounds as would usually be the case, the opportunity would be afforded to parents and to the general public to see the whole school plant—class-rooms, equipment, grounds and gardens—in working order, and this in itself is well worth while.

The holding of the school fair in June would not necessarily mean that the schools would not take part in the fall fairs as is the usual custom. It would mean, however, that the range of exhibits from the schools would be considerably lessened and that they would be largely confined to the realm of agriculture. Field and late garden crops, poultry and livestock exhibits would be most in evidence, and properly so. It would not be a bad thing if many of the non-agricultural exhibits were eliminated from our agricultural fairs. Furthermore, if our agricultural fairs are to fill the important place in the agricultural life of the country which they were originally intended to fill, more drastic measures will have to be adopted to protect the people and particularly the school children from the unwholesome influences of the ordinary "midway." Merely restricting the number of fakirs will not suffice. Complete elimination is the only remedy. Some associations have already done this.

One of the finest attractions at our fall fairs last year was the club exhibits of pigs, calves and poultry. An impetus to the breeding of purebreds has certainly been witnessed through club work in connection with a number of the schools and through the exhibiting of prize stock at the fairs. To have carried for a season the full responsibility for the feeding and management of a valuable young animal, to have watched its continued development in response to that care and finally to have brought it into competition for honours with others of its class, whether winning or losing, means more than profit and loss as usually estimated. It means the developing of certain qualities of true manhood and womanhood, which this country will profit by and which it will need more of in the future.

Another very interesting feature in connection with five or six of the larger fairs was the establishing of junior stock-judging contests for boys and

girls under 18 years of age. Teams of boys and girls from different parts of the province drawn mostly from high school agricultural classes, met at the Vancouver and New Westminster fairs and engaged in these contests, having been previously trained by skilled instructors. A judging team consisted of three members—either boys or girls. At the New Westminster Fair no less than eleven teams lined up for this contest. The teams were entertained there most generously by the Fair authorities who also paid the train fares of all competing teams. At the close of the contest a most enjoyable banquet was tendered to the members of the teams, their respective coaches and a large number of others who were associated with the undertaking. We are looking forward to a splendid year in this as in other lines of work in educational agriculture.

**By Dr. J. B. Dandeno, Inspector
of Agricultural Classes,
Ontario**

The School Fair organizations in Ontario are under the direction of the Department of Agriculture co-operating with the Department of Education through the agency of the Agricultural Representative of the district in the former case, and through the Public School Inspector and teachers in the latter. The linking up of these two departments in school fair activities has accomplished magnificent results and the outlook under this arrangement for the future is promising.

A proposal to place the date of the school fair towards the close of the school year, that is towards the end of June, instead of in the fall, would not meet with much favour in Ontario, because of the fact that the "Fair" idea is directly agricultural and is concerned altogether with agricultural products and activities, whether in the nature of soil products or of animal husbandry,

which follow naturally the calendar year, or rather the season, running from spring to fall. If a fair were held during this season, as early as June, there would be little or nothing to exhibit.

The school fair projects in Ontario deal with garden, orchard and farm crops, and with live stock, such as the rearing and management of calves, colts, chickens, etc., with collections of weeds, seeds and insects, and with canning of fruit grown generally by the exhibitor.

Mr. Gibson points out that in British Columbia the school fair has become so linked up with township or county agricultural fall fair that the one has absorbed the other, and that the school end of it consequently suffers on account of a lack of accommodation.

In Ontario, however, the school fairs have not been united with other fall fairs, although some years ago an effort was made, here and there, on the part of the fall fair officials, to have the school fairs join with them. The school fair organization, in all cases, refused to do this, preferring to run their own show.

The arguments put forth by Mr. Gibson for a change of date do not apply to Ontario. The reason he gives for advocating a change may be inferred from the following statements taken from Mr. Gibson's letter introducing the matter: "There has been too much grandstand play about it." "The teacher constitutes the chief factor in the success of this and similar educational enterprises." . . . "This can be accomplished only under the direction of thorough-going modern educationists." In Ontario school fairs are not troubled with what Mr. Gibson calls "fakirs" or the "Midway," and they are wholly under the direction of modern educationists—the teacher, the inspector and the agricultural representative. To change the date from the fall to June, or to have two fairs, one in the fall and one in June, would be a mistake.

By S. T. Newton, Director Agricultural Extension Service, Manitoba

In Manitoba the school fair, while an important phase of Boys' and Girls' Club work, is by no means the most important feature. In fact it is only a means to an end and the end is the development of a wider knowledge and experience on the part of the boys and girls in better agricultural and home economics methods. It serves the purpose also of getting the young people to have a keener interest in rural life and rural pursuits.

An effort is being made to have club work function throughout the entire year. At one time sports are featured, at another time hikes, garden socials, debates, entertainments, achievement day programmes, etc.

Demonstration team work is a phase of club work carried on for the past three years which bids fair to be one of the most useful agencies in training both the boys and girls.

A demonstration team consists of three boys or three girls—a captain and two demonstrators. Usually the members of the team range in age from fifteen to eighteen years, but any "teen-age" boy or girl is eligible to take part. The fundamental idea in team work is that one or other members of the team is talking while the other two are demonstrating some phase of the subject. A demonstration lasts about forty minutes and the members of a team, in their desire to make their demonstration a success and a source of information for those who have an opportunity of listening to them, read all the bulletins, books and advertising material that they can obtain. Competitions are held in each inspectorial division, and the winners are given a trip to Winnipeg in September, with all expenses paid by commercial firms like the T. Eaton Company and the milling companies, and a whole week

of education, sight-seeing and entertainment. Demonstration teams are now working on the following subjects:—

Treating Grain for Smut.	Flour.
Grain Judging.	Textiles.
Stock Judging.	Flavouring Extracts.
Vegetable Judging.	Beverages.
Grain Marketing.	Upholstering.
Potatoes.	Eggs.
Milk Testing.	Milk.
Lubricating Oils.	Table Setting.
Fuel Oils.	Balanced Meals.
Shoes.	Patterns.
Wheat.	Rye.
Flax.	Oats.
Canning.	Corn.
Dyeing.	Macaroni.
Laundry.	Food Chopper.
Millinery.	Hot Lunches.
Quick Breads.	Labour Savers.
Bread.	Home Cleaners.

The Inspectoral Division is taken as the unit for organization purposes and the school inspector recognized as the club leader in his district.

Co-operation is the key note in club work, the Departments of Education and Agriculture working in close co-operation, with the result that there is no conflict of purpose and the best energies of both departments are at the service of the clubs.

The Club Fairs are all held during the last ten days in September and the first ten days in October. The Agricultural Society Fairs are held during July and August, but even if it were satisfactory to hold the club fairs at the same time as the agricultural fairs, the time is inopportune as only 15 per cent of the exhibits are of school work and the vegetables, chickens, grains, live stock, canning, etc., would in no way represent what the children are doing. On the prairie, or any place else for that matter, a fair held at the end of June cannot possibly serve its purpose if the agricultural features are to be emphasized.

By Fred W. Bates, B.A., M.Sc.,
Director of School Exhibitions, Department of Education, Saskatchewan

The first school exhibition held in Saskatchewan was organized by a group of teachers for the express purpose of placing before their public the work of the school. With the development of the movement, a wider form of organization has arisen, but the original ideal is still dominant. The inclusion of out-of-school activities such as pig-rearing, gardening or canning has intensified rather than weakened this desire, especially since the recognition of Agriculture and Household Science, as regular features of our public school course provides a link between the routine school work and these out-of-school activities.

The organization of Boys' and Girls' Clubs has introduced a new feature. By this means the out-of-school work has been organized more efficiently and in some instances phases of the routine school work have been included. In our province since May 1920 the School Agriculture Branch of the Department of Education has been responsible for the direction of both the School Exhibition and Club activities. The effort to co-ordinate the work has been most successful. During the past season 60 of the 64 clubs were organized by associations which also conducted the school exhibition; the other 4 were organized by Agricultural Societies.

Unless the exhibition is made the culmination of an educational project running throughout the year, it will soon forfeit its place in our school programme. It is comparatively easy to get up a good "show" on short notice but, although the first efforts are usually of that character, the well-established exhibitions are using every possible means to eliminate this serious defect."

In attempting to develop a true school exhibition, many difficulties are encountered. One of the chief problems is to determine the best time to hold the exhibition. To accomplish its true aim it should be held at a time not only when the greatest number of people could attend conveniently but also when the material shown would most truly represent the work of the school. In our province July and early August are the least busy of the summer months and during that period practically all the local agricultural fairs are held. This time however is not satisfactory for the school exhibition for a variety of reasons.

To make the point clear a brief description of conditions is necessary. According to the School Act, "In every rural and village district where school is to be kept open during the whole year there shall be at least seven weeks' holidays of which not less than one or more than six shall be given in summer, to be apportioned at the discretion of the board." Many schools, therefore, have the long vacation during the winter and open with new teachers in late February or March. On the other hand all town schools and the majority of the village schools have the long summer vacation. In these schools, change of teachers usually takes place during mid-summer which makes the early fall a period of re-organization.

Midsummer therefore is not a satisfactory time because the larger schools are closed for vacation and many are changing teachers. On the other hand, while June would seem most appropriate, exhibitions held at that time have not in general proved satisfactory. Bad roads and pressure of work hinder the attendance of adults and the fact that many schools have been open for comparatively short periods reduces the number taking part.

Another consideration in determining the best time is the character of the exhibition. If Agriculture is to receive

its proper recognition, the fair must be held after midsummer. Several associations have attempted to meet the situation by holding an exhibition of class room work in June and another fair in the fall where the agricultural work was shown, but there is no indication that this method will become popular. It has been suggested that the exhibits in school agriculture should be shown at local agricultural fairs but, as these are practically all over before the middle of August, this would not improve the situation.

After considering the problem from every angle, it is apparent that the varied conditions in our province make the selection of a satisfactory date very difficult and absolutely prevent uniformity. September and October, however, while not ideal, have continued to be the most popular exhibition months. Of the 284 held in 1921 only 23 took place in May and June, 16 in July and August and the remaining 245 in September and October. Further, it is interesting to note that the teachers of a whole inspectorate, in attendance at their central exhibition, after trying the spring dates in 1921, decided henceforth to hold their exhibitions in the fall.

Not only should the school exhibition be the culmination of an educational project but the day itself should be definitely maintained as the outstanding "Children's Day" among community activities. To insure this it is almost necessary to hold the exhibition apart from any adult organization such as the ordinary agricultural fair. Experience has shown that when the school exhibition is linked up with adult activities, its distinctive educational characteristics are submerged by the amusement features of the programme. Only about ten of our exhibitions are conducted by organizations formed for other purposes, and notwithstanding the constant growth in the total of exhibitions held, the number thus organized shows a decrease from year to year. It

would seem, therefore, that the school exhibition will best serve its purpose and achieve its aim, when carried by an organization developed for that special work and through which other existing bodies may co-operate in making it the great event of the year for child and adult alike.

In conclusion it is pleasing to note that each year shows advancement toward the ideal and that these and many other problems such as arise in the preparation of exhibits and the allotment of prizes are gradually being solved as teachers and the general public come to understand the true place of the exhibition in relation to the school and its activities.

By L. A. DeWolfe, B.A., M.Sc.,
Director of Rural Science,
Nova Scotia

School Fairs will not be of value educationally until they represent every phase of Home and School work for the whole year. To secure this, there must be close co-operation between the parents and the teacher. Preparation must also begin at the beginning of the year.

One reform is vitally needed before School Fairs can be successful. That is, we must make the school year coincide with the calendar year. In such case, we should then have the same teacher at seed time and harvest. As it is now, with the school year beginning in August, the newly appointed teacher cannot organize a good fair for September. In most cases, she knows nothing of preparations on the part of the previous teacher; and, therefore, concludes that "next year we'll have an exhibition." Of course, "next year" she is gone, and a new teacher repeats the performance.

With the present arrangement of the school year, the only alternative is to hold the exhibition in June. We have advocated this for four or five years;

and in a few sections it has been carried out. Thus the exhibition becomes the public examination. At this time the year's school work can be exhibited; but the garden work is lacking. Some teachers have advocated two exhibitions—one in June and one in September. This will work so long as new activities keep up enthusiasm. There is danger, however, of both teacher and pupils tiring of such work.

Whichever solution is adopted, the exhibitions must become more educative. A few vegetables and flowers hastily gathered together; a little sewing snatched from the work-basket; a few rough boards nailed together and called "woodwork"; business forms and crayola drawings copied from the teacher's model on the blackboard; these, however well they may look at an exhibition, mean nothing more than hard work for the teacher and a few cents in prize money for the children.

Until the regular school notebooks, health charts, and daily records of the year's work are displayed at the end of the year, the exhibition will not be complete. Nor are these, in addition to the ordinary farm and household products, sufficient. Vegetable exhibits should be accompanied by statements explaining their growth and selection. The pupil should also display literature which he studied or consulted for garden information. Charts and maps showing correlation between gardening and regular school work are well worth while. Judges, or others competent to do so, might give short talks to the children on selecting prize materials.

Results of experiments are particularly desirable. These may include exhibits showing the results of different fertilizers, seed selection, land drainage; milk records on different food rations, etc. Here would come, too, new varieties of potatoes, dahlias, or gladioli, grown from seeds. Comparatively few children know how new varieties of our vegetables, flowers and fruits are obtained.

They will frequently tell us that such is the result of grafting (which, of course, is not true).

The best kept garden plot in each school section should receive local recognition. School parades, pageants, games, contests and sports, should be heartily encouraged. Public-speaking contests, or judging competitions, or debates on farm topics are particularly desirable.

Local exhibitions are valuable because all residents can attend. District exhibitions are desirable, however, because they help standardize the local fairs. Teachers should accompany their children to the district exhibition, and take charge of them throughout the day. It is a school exercise—not a holiday.

If school exhibitions should follow the educative suggestions here outlined, the larger exhibitions conducted by the grown-ups of the future will be much more worth while than they now are. At such time the "Fakir's Row" will not be the centre of attraction.

By A. C. Gorham, M.Sc., Director of Elementary Agricultural Education, New Brunswick

To make the School Fair a more permanent part of the school programme is a condition greatly desired by those who have to do with the organizing of school fairs throughout this province.

We realize the fact that the School Fair and the many other projects that lead up to it have not been thoroughly appreciated as educational factors. They have been made an end and have not been used as a means by which to educate boys and girls. Too often they have been mere spectacular events instead of being intellectualized purposeful activities. On the other hand we should not expect too great a development because, as stated above, the project method is

not generally well understood. As is pointed out by the Director of Agricultural Education for British Columbia, it should be under the direction of thorough-going modern educationists.

The question of more closely linking up the school fair activities with daily school programmes is one of vital importance. There is need, it seems to me, at the present time of setting forth, in as concrete a form as possible, the method of procedure, with the project emphasizing the educational value at each step.

Very few of the school fairs held in this province are held in connection with the county or provincial exhibitions although many pupils enter in the larger competition. We found that when the fair was held as a part of the larger exhibition many an educational opportunity was lost.

The school fairs in this province, for the most part, centre about the school house or community hall and are organized by the teachers and pupils in co-operation with the Agricultural Department. The period for the fairs usually begins with Labour Day and ends about October 12. We plan to have one or more officials from this Department attend the school fair and give whatever assistance they may in judging, pointing out to pupils reasons for their placings, on some occasions presenting prizes and explaining the work in general at the public meeting. Often lessons are taught at the fair.

It is stated clearly in the prize list that all exhibits must be the result of the pupil's own efforts under the supervision of the teacher, and must have been produced during the last preceding year. This plan works very well, especially where the teacher who is conversant with the organization remains in the district from year to year.

However the fact that the work which the pupils have to exhibit was produced in a lower grade and is often laid aside

and forgotten, along with the difficulties attending the organizing of fairs during the autumn when many teachers have taken up their work in a certain district for the first time and are therefore unfamiliar with what had been done by their predecessor and also the short time in which they have for preparation after the opening of school make it seem preferable that the fair should be held at the end of the term. Under these conditions all pupils would be taking part and competition within a grade could be arranged with a greater degree of

satisfaction. Each pupil would be required to exhibit the result of work carefully planned and systematically carried out during the year.

The Nature Study work, etc., exhibited in June need not be exhibited at the agricultural school fair held in the fall. This might be considered an advantage because it would lessen the judges' duties and help to do away with the large amount of work connected with the management and also the confusion which often prevails on fair day.

"Judging is one of the most important features of the school exhibition. Not only should the integrity of the judges be unquestionable, but they must also have clear ideas as to what should be encouraged in the various competitions. Careless judging causes dissatisfaction and may result in children forming wrong opinions as to the desirable qualities of exhibits. Children should be given every opportunity to question judges and find out the reasons for the placing of awards; and when possible, judging competitions should be held for the benefit of both teachers and pupils."—*School Agriculture and Club Leader, Regina.*

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

RURAL CREDIT SYSTEMS, ONTARIO

BY A. G. FARROW, CHAIRMAN, AGRICULTURAL DEVELOPMENT BOARD

Short-term Loans

IN order to establish our short-term system of loan, it is necessary to form a Farm Loan Association, according to the following conditions:—

At least five farmers must make application to have a Farm Loan Association established in their township.

Any person resident in the territory described in the application and actually engaged in farming operations, or agreeing to become so engaged within one year, shall be eligible for membership.

No association shall be deemed to be incorporated until a certificate of incorporation setting forth that all the terms of this Act have been complied with has been issued by the board as hereinafter provided.

(1) The amount of the capital stock of the association shall be fixed by the board and shall be made up as follows:—

- (a) One share of par value of \$100 to be subscribed by each member;
- (b) Shares of par value of \$100 to the extent of one-half of the total amount subscribed by individual members subscribed for by the corporations of local municipalities in the territory for which the association is formed.
- (c) Shares of par value of \$100 each to the extent of one-half of the total amount subscribed by individual members subscribed for by the Government of Ontario.

(2) No association shall be incorporated or carry on business until at least thirty members have subscribed for stock in the association.

Each member shall pay ten per cent of the par value of his stock at the time of subscription and the balance when called upon, and payments by municipal corporations and the Government of Ontario shall be made at the same time and in the same proportions as those of individual members.

The council of any local municipality may in their discretion by by-law subscribe to the stock of any association incorporated under this Act to the extent and upon the terms herein provided, and may pay for the stock subscribed for and take all steps incidental thereto and to the carrying out of the provisions of this Act and may issue debentures of the corporation payable within a period not exceeding ten years, for the amount of such subscription in the manner provided by The Municipal Act, but it shall not be necessary to submit any by-law for the issue of such debentures to the electors qualified to vote on money by-laws nor to observe the other formalities in relation thereto prescribed by The Municipal Act.

In the event of two or more municipalities combining in such subscription, the stock held by them may be held in the joint names of the corporations or severally in such proportions as they

may agree upon, and may be acted upon in such joint or separate manner as they may from time to time agree upon.

Upon receipt of a report from the board that an association is being formed in accordance with this Act, the Treasurer of Ontario, with the approval of the Lieutenant-Governor in Council, may subscribe for shares in accordance with clause (c) of section (1) and all necessary payments shall be made out of the Consolidated Revenue Fund or in bonds or other securities issued or guaranteed by the Province of Ontario.

(1) To represent the stock subscribed and to assist generally in the conduct of the business of the association, two directors shall be appointed by a municipal corporation subscribing, or if more than one municipal corporation is subscribing, one director shall be appointed by each corporation and in every case two directors shall be appointed by the Lieutenant-Governor in Council.

(2) Directors named under this section shall serve for a period of two years or until their successors are appointed.

Shares owned by members may be transferred to other members or purchased by the association only with the approval of the board of directors.

The Secretary-treasurer shall be responsible for all moneys or securities realized by the sale of capital stock and such moneys or securities shall, where not needed for liabilities, be invested in bonds or debentures of or guaranteed by a government or municipality, as may be ordered by the directors with the approval of the board.

The subscribing members shall, at such meeting, from among themselves elect a president, vice-president and one director who, with the directors named by the municipality and the province shall constitute the board of directors. The president, vice-president and the director shall hold office for one year, or until their successors are elected.

The Secretary-treasurer, immediately after the holding of the meeting, shall

advise the board that organization has been completed and shall give the names of officers and directors and make application for a certificate of incorporation.

Upon receipt of such application the board may issue a certificate of incorporation to the association in the name approved and thereupon the association shall be a body corporate and shall for all purposes be deemed to be duly incorporated and may carry on business and exercise all the powers conferred upon it by this Act.

Two of the directors elected by the members and three of the directors appointed by the municipality and the Government shall constitute a quorum of the directors of the association.

No officer or director, except the secretary, shall be paid any salary or fee by the association, other than actual disbursements necessarily made in attending to the business of the association and approved by the directors.

The object of an association incorporated under this Act shall be to promote individual prosperity and agricultural development by securing for members short-term loans for current expenditures.

Any member of an association shall be entitled to apply for a short-term loan for any one or more of the following purposes:—

- (a) Purchase of seed, feed, fertilizer and other supplies;
- (b) Purchase of implements and machinery;
- (c) Purchase of cattle, horses, sheep, pigs and poultry;
- (d) Payment of cost of carrying on any farming, ranching, dairying or other agricultural operations;
- (e) Payment of the cost of preparing land for cultivation;
- (f) Fire or life insurance where required, in the opinion of the directors, as collateral security for a loan made for any of the above mentioned purposes.

No loan to any member shall exceed in amount \$1,000 but an additional loan or loans may be made to a member of an association, provided that the total amount of indebtedness outstanding on account of any member shall not at any time exceed \$1,000.

Any member of an association desiring a loan shall sign an application in the form prescribed, stating the amount required and the purpose for which it is to be used, and agreeing to repay the said loan at a date therein to be named, which shall not be later than the thirty-first day of December next thereafter, together with interest at the rates fixed in accordance with the terms of this Act.

All such applications shall be delivered to the secretary and shall be by him presented to the directors at the next following meeting, and the directors shall determine whether any such application shall be approved, and may approve the same in part or on such terms as they may deem proper, and may demand such security from the applicant as they may think necessary. In the event of the application being approved in part only, or being varied, a new application shall be signed by the applicant in accordance with the approval and the former application cancelled.

When an application has been finally approved by the directors, such approval shall be certified on the application in the form prescribed and shall be signed by the secretary and by the president or vice-president, and a record of all applications approved shall be entered in the minutes of the association. One duplicate or copy thereof shall be delivered to the applicant and another duplicate or copy retained by the association. In the event of the absence from any cause of any such officers, the directors may by resolution authorize any other officer to sign the approval in his stead.

Before any moneys are advanced in pursuance of an approved application, the lender or association may require the borrower to sign a note or notes for the amount of the moneys to be advanced,

and the association shall endorse such note or notes, but the terms of such notes shall not vary in any way from the terms of the approved application or from the provisions of this Act. The secretary is hereby authorized to endorse such notes on behalf of the association.

The rate of interest payable by a borrower on a loan guaranteed by an association shall not exceed seven per cent per annum, and out of the interest paid one-seventh shall be paid to the association for the purposes hereinafter mentioned, which share of interest shall be paid by the lender to the association as soon as the loan and all interest thereon has been received by him and the security given to the lender shall not be surrendered until all such interest charges have been paid.

In the event of a borrower not being able to repay the amount of his loan on or before the thirty-first day of December for reasons which appear to the directors to be justifiable or on account of the loan having been granted for purposes not productive within one year, the directors may, on application of the borrower, authorize a renewal of any portion of the said loan until such further time as may be agreed, but not later than one year next after the maturity of the previous loan. The application for such renewal loan shall be in the same form as for any original loan, except that it shall be stamped with the word "Renewal," and shall be kept distinct from any new application made by the same borrower, but in all other respects the provisions of this Act relating to applications and the endorsements thereof, and the rights and liabilities arising thereunder, shall be applicable to such renewals.

The Board shall have general supervision of all associations incorporated hereunder, and all books and records of any association shall be open at all times to inspection and audit by the board or such other person as may be named by the Lieutenant-Governor in Council.

The moneys received by an association from the share of interest received by it shall be applied:—

- (a) In payment of the necessary expenses of the association;
- (b) In payment of a dividend on the paid-up stock of not more than six per cent per annum;
- (c) In accumulating a reserve which may, in the discretion of the directors, be invested in the same manner as the capital stock; in the event of the dissolution of any association, any accumulated reserve shall be divided amongst the subscribers in proportion to the amount of the capital stock respectively held by them.

Long-term Loans

The Agricultural Development Act provides that the Board may loan money for the following purposes and no other.

- (a) Acquiring land for agricultural purposes;
- (b) The erection of farm buildings essential to production;
- (c) To pay off charges existing against land at the time of acquisition by the borrower under a will or by descent.

These loans can be made at 6 per cent interest to an applicant who can qualify, as follows:—

- (a) That he is a British subject of at least twenty-one years of age and has been resident in Ontario for at least three years;
- (b) That he has had at least three years' experience in farming and has displayed average ability and capacity;
- (c) That he is of good character;
- (d) That he is actually engaged or intends to engage upon the land upon the security of which the loan is to be made.

A loan to any one person shall not exceed \$12,000, and shall not be made for longer period than five years, on security of less than fifty acres of land, and

every loan shall be secured by a first mortgage upon land suitable for agricultural purposes.

Every loan made by this board shall be repayable in equal annual instalments of principal and interest sufficient to discharge the debt at the end of such period as may be agreed upon, but no loan shall be made for more than twenty years; or less than three years. Payments on account of the said loan in addition to those provided for in the mortgage may be made on any date on which an instalment of principal and interest falls due.

An applicant desiring a loan applies to the Agricultural Development Board for an application form. This form is very similar to that used by the different mortgage corporations, in that it calls for a complete legal description of the property against which the loan is required, also particulars as to the purpose of the loans. It calls for particulars regarding the applicant, the nature of the farm, his buildings, his stock and implements. In other words, information which enables the board to form a reasonably accurate idea as to whether or not the applicant should be, with the assistance of a loan from this department, in a position to proceed with his farming operations successfully. Providing that the application is proper, the board has the property inspected by one of their valuators, who also makes detailed inquiry into the character and ability of the applicant. This will be attached to the application form for consideration by the board, and, in cases where desired, the applicant appears before the board. The case is considered by the board, and the applicant notified as to their decision. If favourably considered, mortgage papers are drawn and presented for execution through a solicitor in the community in which the applicant lives. When all legal requirements are completed in this respect, including searching of title of the applicant's property, and everything found to be in order, the money is paid over to the applicant.

ANNUAL AGRICULTURAL STATISTICS IN
CANADABY ERNEST H. GODFREY, F.S.S., CHIEF, AGRICULTURAL DIVISION, DOMINION BUREAU
OF STATISTICS, OTTAWA

CONTINUOUS annual estimates of the areas and production of field crops and of the numbers of farm live stock were begun for Canada in 1908 by what was then known as the Census and Statistics Office, but is now the Dominion Bureau of Statistics. The system at first adopted, and which lasted until 1916, was, starting from the census records as a datum line, to estimate from the returns of crop correspondents the areas sown to field crops each year and the numbers of farm animals in plus or minus percentages of the previous year. The imperfection of this system consisted in the fact that any error in one year became multiplied in each succeeding year and before the time when the next census returns were available, the amount of error might be considerable. This is what actually happened during the decade 1908 to 1917, and when the present Dominion Statistician was appointed in 1915 it was determined to adopt new plans following the recommendations of the Departmental Commission on the Official Statistics of Canada who reported in 1912.

After exhaustive study, the present plans for the annual collection of agri-

cultural statistics were put into force, tentatively in 1917 for the four provinces of Quebec, Saskatchewan, Alberta and British Columbia, and permanently from 1918 for all the nine provinces. These plans consist in the collection under arrangements made between the Dominion and Provincial Governments of annual returns from individual farmers through the agency of the rural school teachers and children, except in British Columbia where the returns are collected direct through the post office. After compilation of the returns received, the totals are estimated proportionately to the number of farmers (in Ontario proportionately to the total areas of cleared land) and are agreed to jointly by both the Dominion and provincial authorities. Thus, not only are the totals arrived at by sounder statistical methods, but their acceptance jointly by the Dominion and Provincial Governments obviates the conflict of official figures which formerly proved so embarrassing.

The following statement shows for 1921 the approximate number of farmers in each province, with the number and percentage of the schedules actually returned for the five years 1917 to 1921:

Province	Number of Farms 1921	Number of Returns					Percent: ge of Returns				
		1917	1918	1919	1920	1921	1917	1918	1919	1920	1921
P. E. Island.....	13,888	—	7,766	3,770	4,903	4,414	—	55	27	36	32
Nova Scotia.....	46,269	—	20,868	12,136	16,249	16,781	—	38	24	30	36
N. Brunswick.....	35,562	—	13,937	6,643	7,266	5,853	—	36	17	19.5	16
Quebec.....	142,017	28,133	34,894	24,735	19,076	29,374	21	20	17	13	21
Ontario.....	184,337	—	79,968	36,213	31,342	37,870	—	43	19	17	20
Manitoba.....	55,184	—	17,808	10,536	16,738	15,271	—	38	21	33	28
Saskatchewan.....	120,900	35,592	46,089	35,531	35,939	32,660	34	34	34	34.6	27
Alberta.....	86,000	14,444	13,574	4,919	14,454	11,862	21	20	7	21	14
British Columbia.....	14,211	6,886	6,534	7,970	8,694	5,986	46	42.5	58	60	42
Total.....	698,368	—	241,438	142,453	154,661	160,071	—	36	21.5	23	23

In the years 1920 and 1921 for crop areas, and in the year 1921 for farm animals, the returns of the census of 1921 when available will serve to control the annual estimates; and when these results are known it will be possible for the governments concerned to gauge the value of the system applied and to amend it by conference or otherwise in the light of the experience gained.

Meanwhile arrangements are being proceeded with for the collection of the statistics of 1922 on the lines of the four previous years, and the principal object of the present article is to draw the serious attention of readers of the *Gazette* to the plans proposed and to enlist their sympathetic co-operation in obtaining the adhesion of farmers by the filling up of the annual schedule to be issued next June.

With the experience of the Great War, when accurate statistics of all national resources proved of vital importance, it is late in the day to question the necessity for annual agricultural returns; yet from time to time one hears their value questioned by farmers themselves, who sometimes consider that statistics are of value only to grain dealers and other traders who use them to the detriment of the farming interest. It is advisable, therefore, briefly to set forth some of the reasons why sound agricultural statistics are necessary not only for national purposes but also especially for the use of individual farmers.

In the first place no government can be satisfactory which does not take accurate account of the country's national resources. Knowledge of total production in volume and value, of its distribution as between province and province, of its distribution as between crop and crop, is essential to the local Legislatures, the Dominion Parliament, and the administrations they support, for securing an equitable adjustment of national and provincial burdens and a fair apportionment of public moneys devoted to reproductive purposes. In the complex machinery of a civilized democracy

important public discussions necessarily precede new departures in policy. In these discussions economists, bankers, journalists, parliamentarians and publicists of all kinds take their part, and all require accurate statistical information upon which to base conclusions. In no branch is accurate statistical information more necessary than in that of agriculture, the very basis of individual and national existence. But if the classes named require agricultural information at the hands of those best qualified to give it, viz., the practical farmers of the country, these themselves are by no means the last to require and to derive benefit from agricultural statistics. In the absence of such statistics, farmers can only grope their way in the dark and be at the mercy of those who exploit ignorance.

Let us take concrete instances. In 1921 there was a glut of potatoes, caused by first an abundant harvest in 1920 upon an increased area following dearth in previous years, and secondly a mild winter reducing wastage to a minimum. The annual statistics showed just what the acreage and yield were and how distributed by provinces. Without such information all concerned in the cultivation and marketing of potatoes would have been working in the dark or at best only by guess work. The statistics of 1921 show a falling off in the area sown to flax of some 895,000 acres, or 37 per cent, the reduction doubtless being mainly due to the fall in price. The acreage is now much below the average, and international statistics show similar reductions in other countries. The intelligent farmer will watch this situation and be prepared to anticipate and benefit from the recovery in price when demand shall overtake supply. At the present time farmers in the West are being advised to sow more rye, and the advantages of fall-sown rye are being especially advocated. The annual statistics measure the progress that is being made in this direction, and it is significant that for 1921 the area reported as under rye has in-

ereased from 649,654 acres to 1,842,498 acres. Last year the average yield per acre of hay and clover was the lowest on record—a fact statistically ascertained—and the total yield was only 11,366,100 tons, as against 16,348,000 tons, the record crop of 1919. The timely publication of facts of this kind enable dealers and exporters to regulate their business, and the farmer being dependent upon the merchant for the disposal of his surplus is equally interested. By the publication of agricultural statistics the farmer is placed on a level with the merchant in the market place and is in a better position to secure a fair deal.

In the absence of statistics of total production, the individual farmer is decidedly handicapped, for whilst the dealer knows what supplies are coming forward in bulk the farmer knows only his own production, which if above average may mislead him into thinking that the total production of his province or country may also be over average, when the contrary may be the case. It is the total which rules the price, and knowledge of this total is essential to good business. In the case of wheat, the price is set by world conditions, and it is of vital importance to Canadian agriculturists—and therefore the Canadian individual farmer—to have accurate knowledge of the production of other countries. With the elimination of the great Russian Empire—formerly the world's largest wheat-producing unit—Canada is become the third largest wheat-growing and the second largest wheat-exporting country, and this although the population does not exceed about 8½ millions. It is only through international statistics towards which Canada contributes her share, that the recent great fall in the price of wheat can be understood. The wheat crops of the world in 1921 have proved generally excellent, the northern hemisphere alone having a yield over 5 per cent above that of 1920, and above the average of the five years 1915-19. Great Britain and France have the largest yields of wheat per acre on

record. This means that the importing countries will not require so much wheat as usual, and necessarily the price for wheat from the exporting countries has fallen as a consequence of the more abundant supply in prospect.

Summarizing briefly the reasons why accurate statistics are valuable and even indispensable to farmers themselves, we conclude as follows: Farmers are vitally interested in knowing the trend of agricultural production; so that they may understand better how to regulate their own course of cultivation and stock raising. They occasionally require financial credit from their bankers, who will not extend credit without knowledge of the security afforded by crop prospects and crop yields. The provincial Legislatures, the Dominion Parliament, and the administrations they respectively place in power require accurate knowledge of the country's general resources in order to hold the balance fairly between all classes. The trading classes who market the products of the farmer must be accurately informed of conditions; so that they may sell to the best advantage in the interest of the farmer as well as of their own. Business men make constant inquiries as to profitable openings for their enterprises. These can only be satisfactorily ascertained by accurate knowledge of local production. It is to the interest of the farmer that profitable commercial enterprises should be established in his locality. Finally, agricultural statistics furnished on the highest trustworthy authority prevent or counteract the mischief done by inaccurate statements issued from interested motives.

The Dominion and Provincial Governments of Canada at considerable expense have inaugurated plans for the annual collection of agricultural returns upon methods that are statistically sound, but which depend upon the active co-operation of the farmers of Canada for the degree of accuracy to which they may attain. For those farmers who fail to fill up and return the simple schedule

annually issued to them, resort to estimation is necessary, and therefore it is these defaulting farmers who must be held responsible for inaccuracy in the totals published. In a paper on "Agricultural Statistics: Their Collection and Use," read before Section M of the British Association on the occasion of its meeting at Edinburgh, Scotland, on September 12 last, by Sir Henry Rew, K.C.B., who, until lately, was responsible for the agricultural statistics of the English Ministry of Agriculture, it is pointed out that the present admirable annual agricultural statistics of the Mother

Country originated in respect of acreage and live stock returns in 1866 and in respect of produce in 1885. The returns annually required from farmers were voluntary until under the stress of the Great War they were made compulsory by the Corn Production Act of 1917. Under the voluntary system, however, returns were received from all but about 3 per cent of the farmers of Great Britain. It is to be hoped that the annual agricultural statistics of Canada collected on similar principles may ultimately attain to an equal degree of perfection.

AGRICULTURAL PRODUCTION OF CANADA IN 1921

BY ERNEST H. GODFREY, F.S.S., CHIEF, AGRICULTURAL DIVISION, DOMINION BUREAU OF STATISTICS, OTTAWA

THE agricultural season of 1921 will be remembered for an extraordinary and prolonged drought, which prevailed in most countries of the northern hemisphere. Notwithstanding this, however, Great Britain and France produced excellent wheat crops with average yields per acre the highest on record in both countries. In Canada the wheat crop on the whole proved fair, although the yield per acre for the Dominion was less than in 1920 and was below the decennial average. Threatened disaster, due to the prevailing drought, was averted by heavy rains which fell over most of the province of Saskatchewan in June, giving abundant moisture when most needed. In September, when fine weather is usual, heavy rains in the same province, whilst the grain was in stock, prevented threshing and lowered both yield and grade; but the average turned out to be superior to that of 1920 by $2\frac{1}{2}$ bushels per acre, and the total yield of wheat for Saskatchewan, as finally estimated, was 188,000,000 bushels, as compared with 113,135,000 bushels in 1920. This was the highest

total for Saskatchewan since 1915. In most of the provinces the grain yield was seriously affected by the drought, whilst the average yield per acre of hay and clover for Canada, only slightly over one ton, is the lowest on record. As usual during a hot season, corn proved exceptionally fine, and wherever ensilage is practised farmers were able to fill their silos with fodder corn, which will largely compensate for the scarcity of hay. Fortunately the drought was broken during September in time for the rains to prove of some benefit to late potatoes, to root crops and to pastures upon which, owing to the absence of frost, cattle were able to graze up to a later date than usual.

Areas and Yields of Crops

According to estimates published at the end of November, the area sown to wheat in Canada for 1921 was 23,261,224 acres, as compared with 18,232,374 acres in 1920. These figures were published under reserve; they are based upon actual returns collected from about a quarter of the farmers of Canada, and in

arriving at the total, preliminary census data showing the total number of farms were partially applied. Consequently the figures are not exactly comparable with those of 1920, because the difference is partly due to actual change and partly to correction of data. The actual increase in the wheat area is estimated at over 3,000,000 acres, and represents to some extent a recovery from the de-

crease in 1920, occasioned by the exceptionally late seeding season of that year.

Subject to final correction when the census returns of 1921 shall have become available, the following table shows the areas and yields of all the principal field crops for 1921, as compared with 1920, as well as the average yields per acre for the decennial period 1911 to 1920:—

Field crops	1920	1921	1920	1921	1920	1921	10 year average 1911-20
Spring wheat.....	17,418,241	22,540,589	243,720,100	285,337,900	14.00	12.75	16.25
Fall wheat.....	814,133	720,635	19,469,200	15,520,200	24.00	21.50	23.00
All wheat.....	18,232,374	23,261,224	263,189,300	300,858,100	14.50	13.00	16.50
Oats.....	15,849,928	16,949,029	530,709,700	426,232,900	33.50	25.25	33.75
Barley.....	2,551,919	2,795,665	63,310,550	59,709,100	24.75	21.25	25.75
Rye.....	649,654	1,842,498	11,306,400	21,455,260	17.50	11.75	16.50
Peas.....	186,348	192,749	3,528,100	2,769,981	19.00	14.25	16.50
Beans.....	72,163	62,479	1,265,300	1,089,900	17.50	17.50	16.25
Buckwheat.....	378,476	360,758	8,994,700	8,230,100	23.75	22.75	22.25
Flax.....	1,428,164	533,147	7,997,700	4,111,800	5.60	5.75	9.00
Mixed grains.....	811,634	861,136	32,420,700	22,271,500	40.00	25.75	34.50
Corn for husking.....	291,650	296,866	14,334,800	14,904,000	49.25	50.25	53.75
Potatoes.....	784,544	701,912	133,831,400	107,246,000	170.50	152.75	151.25
Turnips, etc.....	290,286	227,675	116,390,900	79,150,300	401.00	347.75	363.75
Hay and clover.....			tons	tons	tons	tons	tons
Fodder corn.....	588,977	585,395	13,338,700	11,366,100	1.30	1.07	1.50
Sugar beets.....	36,288	28,367	5,641,750	6,361,600	9.60	10.75	9.15
Alfalfa.....	238,556	263,892	412,400	268,000	11.37	9.45	9.30
					2.45	2.50	2.45

As shown in the table, the total production of wheat in 1921 is estimated at 300,858,100 bushels, as compared with 263,189,300 bushels in 1920. The crop for 1921 is the largest reported since the great harvest in 1915, when the yield was about 393,500,000 bushels; but the result is due rather to expansion of the acreage sown than to high average yield per acre. Oats show the total of 426,232,900 bushels, as compared with the record of 530,709,700 bushels in 1920. The total area under field crops in 1921

is 59,635,346 acres, as compared with 52,830,865 acres in 1920, but as above indicated the difference is due partly to corrections. Measured both by area and yield, Canada, in spite of her relatively small population, is now the third largest wheat-producing country in the world.

The following statement shows for 1921 the area and yield of the principal grain crops, divided as between Eastern Canada, the Prairie Provinces and British Columbia:—

Crops	Eastern Canada	Prairie Provinces	British Columbia	Total for Canada		
Wheat.....	000 acres 1,034	000 bush. 19,581	000 acres 22,181	000 bush. 280,098	000 acres 23,261	000 bush. 300,858
Oats.....	6,073	139,330	10,820	284,147	56	2,756
Barley.....	678	14,720	2,109	44,682	9	307
Rye.....	148	2,219	1,688	19,110	6	126
Flaxseed.....	16	166	517	3,946	.....	533

The Potato Harvest

On the whole the potato harvest of 1921 turned out well, though it did not equal the great record of 1920. The yield per acre was especially good in the West. It was highest in New Brunswick with 216½ bushels, as compared with 198 bushels last year and 183½ bushels the decennial average. The yield in Quebec was 162½ bushels, as against 185½ bushels last year and 153 bushels the ten-year average. In the other provinces the yields ranged from 93·8 bushels in Ontario, where the drought was most severely felt, to 176½ bushels in Saskatchewan and 176 bushels in British Columbia. The area planted was somewhat less

than last year, being 701,912 acres, as against 784,544 acres, and the total yield for Canada in 1921 is 107,246,000 bushels, as against 133,831,400 bushels in 1920 and 101,388,300 bushels, the annual average for the five years 1916-1920. With anything like an average keeping season, the supply should prove ample for the needs of consumers until next year's harvest.

Value of Field Crops, 1921

Below is the final estimate of the value of the field crops of Canada for the year 1921, as compared with the two preceding years 1919 and 1920:—

Field Crops	1919		1920		1921	
	Per bush.	Total Value	Per bush.	Total Value	Per bush.	Total Value
Wheat.....	\$ 2.37	457,722,000	1.62	427,357,300	0.81	242,936,000
Oats.....	0.80	317,097,000	0.53	280,115,400	0.34	146,395,300
Barley.....	1.23	69,330,300	0.83	52,821,400	0.47	28,254,150
Rye.....	1.40	14,240,000	1.33	15,085,650	0.72	15,399,300
Peas.....	2.86	9,739,300	2.42	8,534,300	1.96	5,439,400
Beans.....	4.48	6,214,800	3.88	4,918,100	2.90	3,155,800
Buckwheat.....	1.50	15,831,000	1.28	11,512,500	0.89	7,285,100
Mixed grains.....	1.36	37,775,400	0.90	29,236,200	0.62	13,901,220
Flax.....	4.13	22,609,500	1.94	15,502,200	1.44	5,938,400
Corn for husking.....	1.30	22,080,000	1.16	16,593,400	0.83	12,317,000
Potatoes.....	0.95	118,894,200	0.97	129,803,300	0.77	82,147,600
Turnips, etc.....	0.50	54,958,700	0.41	48,212,700	0.34	26,620,400
per ton			per ton		per ton	
Hay and clover.....	20.72	338,713,200	26.10	348,166,200	23.56	267,764,200
Grain hay.....	29.00	4,379,000	33.12	4,518,000	11.23	14,476,000
Alfalfa.....	21.85	10,800,200	23.79	13,887,700	19.95	13,211,000
Fodder corn.....	6.92	34,179,500	7.75	43,701,000	7.05	44,880,800
Sugar beets.....	10.86	2,606,000	12.80	5,278,700	6.50	1,742,000
Total.....		1,537,170,100		1,455,244,050		931,863,670

By provinces, the total value for the same years is as follows:—

Province	1919	1920	1921
	\$	\$	\$
Prince Edward Island.....	22,367,400	18,530,400	14,202,970
Nova Scotia.....	63,357,000	47,846,550	29,556,400
New Brunswick.....	53,134,400	46,357,300	38,325,400
Quebec.....	309,963,000	330,251,000	219,154,000
Ontario.....	383,573,900	375,746,900	239,627,400
Manitoba.....	182,097,200	133,989,900	72,135,500
Saskatchewan.....	340,029,800	271,213,000	215,635,000
Alberta.....	158,044,400	204,291,500	82,780,000
British Columbia.....	24,603,000	27,017,500	20,447,000
Total.....	1,537,170,100	1,455,244,050	931,863,670

In general the unit prices for all descriptions are considerably less for 1921 than they were for either of the two preceding years; in fact for wheat the price per bushel for 1921 is only 6 cents above the pre-war average 1910-14, whilst for oats and barley the prices per bushel are somewhat less.

Wheat for the whole of Canada averages 81 cents per bushel, as against \$1.62 in 1920; oats are 34 cents as against 53 cents and barley is 47 cents, as against 83 cents. Other grain prices have similarly fallen. The average for potatoes is

77 cents per bushel as against 97 cents in 1920 and 95 cents in 1919. The price for hay and clover, *viz.*, \$23.56 per ton, compares with \$26.10 in 1920 and \$20.72 in 1919, but the low yield per acre, causes the total value to be over \$80,000,000 less than in 1920.

Farm Live Stock

The following table shows the total number of horses, cattle, sheep, swine and poultry, estimated from the returns of June, 1921, as compared with each of the three previous years:—

Description	1918	1919	1920	1921
Horses.....	No. 3,609,257	No. 3,667,369	No. 3,400,352	No. 3,813,921
Mules.....	10,261	15,102	9,055	10,424
Milch Cows.....	3,538,600	3,548,437	3,504,692	3,736,832
Other Cattle.....	6,507,267	6,536,574	6,067,504	6,469,373
Total Cattle.....	10,045,867	10,085,011	9,572,196	10,206,205
Sheep.....	3,052,748	3,421,958	3,720,783	3,675,860
Swine.....	4,289,682	4,040,070	3,516,678	3,904,895
Poultry—				
Hens.....	31,334,498	31,785,722	25,942,105	34,340,474
Turkeys.....	1,061,982	839,711 ¹	791,766 ¹	1,199,494
Geese.....	879,177	802,869 ¹	754,455 ¹	880,014
Ducks.....	884,034	777,692 ¹	617,638 ¹	762,135
Total Poultry.....	34,159,691	34,645,238 ¹	30,505,819 ¹	37,182,117

¹ Not including Alberta. ² Including 439,244 other than hens in Alberta. ³ Including 2,399,855 poultry of all kinds in Alberta.

The total number of horses in 1921 was 3,813,921 as compared with 3,400,352 in 1920. Mules numbered 10,424, as against 9,055. Cattle numbered 10,206,205, as against 9,572,196; sheep, 3,675,860, as against 3,720,783, and swine, 3,904,895, as against 3,516,678. All descriptions have, therefore, increased since last year, excepting sheep, which for the first time since 1917 show a decrease, this amounting to 44,923. Poultry show large increases as compared with 1920, hens from 25,942,105 to 34,340,474; turkeys from 791,766 to 1,199,494; geese from 754,455 to 880,014, and ducks from 617,638 to 762,135. By provinces, horses have increased in the Prairie Provinces and in British Columbia, but show a decrease in the remaining provinces. Cattle have increased in all parts, except the Maritime Provinces

and Quebec. Sheep show a decrease, except in Prince Edward Island, Saskatchewan, Alberta and British Columbia, where there is an increase. Swine show a decrease in the Maritime Provinces, Ontario and British Columbia, and an increase in the other provinces. Poultry show an increase, except only in Nova Scotia and New Brunswick. As in the case of field crops, the differences are due partly to correction by census data and partly to actual change.

Great attention is now being paid to poultry raising and the production of eggs, for which a remunerative market is assured, especially during the winter. According to official calculations the production of eggs in Canada during the year 1921 was about 161,971,000 dozen from 34,340,474 farm hens, as compared with 121,604,000 dozen from 25,942,105 hens in 1920.

The total value of the farm live stock of Canada in 1921 (horses, cattle, sheep and swine) is estimated at \$766,720,000, as compared with \$1,041,246,000 in 1920. The total for 1921 comprises \$314,764,000 for horses; \$190,157,000 for milch cows; \$183,649,000 for other cattle; \$23,308,000 for sheep; and \$54,842,000 for swine. The value of farm poultry is placed at \$38,007,000, as compared with \$37,016,000 in 1920.

Area Under Pasture in Canada

The following are estimates, subject to correction for the years 1920 and 1921 by the census data when available, of the areas under pasture in seven of the provinces of Canada, the estimate being derived from the schedules annually collected by the Dominion Bureau of Statistics, in co-operation with the provincial Governments:—

Province	1918	1919	1920	1921
Prince Edward Island.....	217,927	233,982	247,360	250,098
Nova Scotia.....	1,199,091	1,177,099	1,075,827	955,030
New Brunswick.....	610,799	723,972	663,012	613,030
Quebec.....	4,764,548	3,893,777	3,869,696	4,016,723
Ontario.....	3,561,754	3,499,802	3,432,620	3,401,998
Saskatchewan.....	933,862	831,592	784,234	678,815
British Columbia.....	45,000	61,220	61,942	61,508
Total for the seven provinces.....	11,332,981	10,421,444	10,134,691	9,977,204

In addition, "range pasture" in British Columbia was estimated at 891,249 acres in 1921, as compared with 847,720 acres in 1920.

Dairying in Canada, 1920

In 1920 there were altogether 3,161 dairy factories, manufacturing butter, cheese and other products. The total production of creamery butter in 1920 was 111,691,718 pounds, as compared with 103,890,707 pounds in 1919, of factory cheese 149,201,856 pounds, as compared with 166,421,871 pounds in 1919. The total value of the dairy factory products in 1920 was \$149,336,491, as against \$135,196,602 in 1919, the items for 1920 comprising \$63,625,203 for butter, \$39,100,872 for cheese and \$42,610,416 for miscellaneous products. Quebec and Ontario continue to be the great dairying provinces of the Dominion, but steady and satisfactory progress is being made in the dairying industry in the West. Quebec and Ontario together produce 70 per cent of the total creamery butter and 97 per cent of the total of factory cheese. These figures do not include the large amount of dairy or

home-made butter, estimated at 125,000,000 pounds for 1920 and the small amount of home-made cheese (1,363,261 pounds in 1910).

Miscellaneous

The commercial production of apples in 1920 amounted to 3,404,340 barrels of the value of \$29,849,149 as against 3,384,660 barrels, value \$24,396,210, in 1919. Nursery fruit stock sold showed also a gratifying increase, the value being \$500,167 for the year ended September 30, 1920, as against \$270,818 in 1919. Tobacco in 1921 occupied about 11,800 acres, as against 53,000 acres in 1920, Ontario growing about 6,500 acres and Quebec about 5,300 acres, the decrease being attributed to the fall in price. The same cause accounts for a decrease in the area sown to fibre flax, which has fallen from 31,000 acres in 1920 to 6,515 acres in 1921. Of maple sugar, the production in Quebec in 1921 was 12,228,514 pounds, as against 15,615,161 pounds in 1920, and of maple syrup 1,375,635 gallons, as against 1,444,649 gallons in 1920. The production in Quebec represents all but about 5 per cent of the total for Canada.

Total Value of Agricultural Production, 1921

Using the data available, the following are rough calculations of the gross value of the agricultural production of Canada for the year 1921: Field crops \$931,863,670, as compared with \$1,455,244,050 in 1920; revenue from farm ani-

mals, including wool, \$101,475,000, as against \$145,404,000; dairy products \$260,000,000, as against \$260,337,000; fruit and vegetables \$40,000,000, for both years; poultry and eggs \$75,000,000, as against \$65,000,000; miscellaneous \$8,000,000; as against \$23,000,000, making the total \$1,416,339,000 for 1921 as against \$1,988,985,000 for 1920.

ROYAL AGRICULTURAL WINTER FAIR ASSOCIATION OF CANADA

Royal Winter Fair Assured for 1922

BY C. F. BAILEY, MANAGING DIRECTOR

READERS of the *Agricultural Gazette* will no doubt recall the unfortunate circumstances which finally brought about the cancellation of the Royal Winter Fair last October. The city of Toronto entered into an agreement with the Royal Winter Fair Association early in June of last year to construct, heat, light and equip a building costing upwards of \$1,000,000 which was to be the home of the Royal Winter Fair. The association, on the other hand, agreed to pay to the city \$40,000 annually toward capital account and \$10,000 annually for rental for a period of ten years. The construction of this building, which contains 8½ acres of floor space with an arena seating upwards of 7,000 people, was started on the 9th of June and completed by the 10th of November. It must be admitted that this was a remarkable performance, especially in view of conditions and the size of the building. However, the question of heat and equipment was not seriously considered by the city until September and it was finally found to be impossible to get any assurance that the building would be ready in time for the dates set for the Royal Winter Fair—namely, November 16 to 24. After careful consideration of the whole question, the executive committee (authorized by the board of directors) finally decided to

cancel the show. In doing this, they fully realized that exhibitors all over the Dominion and in many parts of the United States had been preparing for some months to exhibit at the Royal. These exhibitors were undoubtedly put to a great deal of expense in making preparations and would naturally be very much disappointed. However, it was felt that the prospects for success under prevailing conditions were so doubtful that there seemed to be no other alternative. Subsequent events have fully demonstrated that the executive committee was justified in its action.

I am pleased to say that the Royal Winter Fair executive has succeeded in making a very satisfactory adjustment with the city in that the city has agreed—

- (1) To have the ten-year contract with the association date from 1922 instead of 1921;
- (2) To credit the association with \$15,000 on its first annual payment to the city in lieu of the expenses incurred by the association during the past year, and
- (3) To do everything that can reasonably be done to have the building properly equipped.

The executive committee has also been assured that the city is behind the Royal Winter Fair and prepared to assist in every possible way to make it a success.

In view of the fact that the association has made such a satisfactory ar-

angement with the city, the Royal Winter Fair in 1922 is assured and it now behooves the agricultural interests to co-operate financially and otherwise in making it fill a very important place in the agricultural development of Canada.

NEWS ITEMS AND NOTES

Dr. A. E. Watson, Chief Animal Pathologist, Health of Animals Branch of the Dominion Department of Agriculture, has returned from Labrador and Norway, where he investigated the reindeer industry, looking to the importation of reindeer into Canada.

The volume of seed testing required to be done by the Seed Branch at Ottawa, has led to the opening of a Dominion Seed Laboratory in Toronto. Suitable equipment has been installed and testing has already commenced in the General Post Office Building at 36 Adelaide St. East. Not only will the congestion at the Ottawa Seed Laboratory be relieved, but convenient and prompt service can thus be given to the large wholesale exporting seed trade centering in Toronto. This laboratory will be so organized and staffed as to give service for the whole Western Ontario inspection district.

The Dominion Fruit Commissioner, Mr. C. W. Baxter, attended the Markets Conference held at Guelph in January last and gave a talk on Grading and Standardizing. Mr. Baxter was also present at the Nova Scotia Fruit Growers' annual gathering, which, he says, is reported to have been the best in the history of the Association. The fruit growers having had three good years in succession are in an optimistic frame of mind.

At the recent meetings of the Entomological Society of America, held in Toronto in affiliation with the American Association for the Advancement of Science, Mr. Arthur Gibson, Dominion Entomologist, was elected president of the Entomological Society of America.

The European Corn Borer, a recently imported and serious pest in southwestern Ontario, is reported to have increased 300 per cent in numbers in the last two years. In 1921 it absolutely ruined numerous fields of early sweet corn and in one district caused a loss of 70 per cent in fields of Flint corn. The Entomological Branch of the Dominion Department of Agriculture is organizing a community experiment to test recommended methods of control.

The third general conference of the staff of the Entomological Branch of the Dominion Department of Agriculture was held at Ottawa in January. The various activities of the Branch were brought under review, and a general discussion took place on the relation of insects to plant diseases, special emphasis being laid on the relation of the leaf-hopper to tip burn of potatoes, and aphids to mosaic disease and yellows of raspberries, and the death of balsam following spruce bud-worm injury. It was felt that as a result of this meeting there should be more co-operative work between entomologists and phyto-pathologists.

The conference as a whole was decidedly successful and it is anticipated that much benefit will follow as a result of the various officers having an opportunity to express and exchange their ideas and opinions.

From reports received by the Dominion Entomologist, it would appear that the codling moth situation in British Columbia is becoming more serious, and that hereafter growers will have to take an active part in control measures in the affected districts.

The Dominion Entomologist reports that after very thorough inspection of the city of St. John, N.B., and a certain section of Queens county, N.S., where outbreaks of the gipsy moth were reported, no moths or egg clusters were detected.

The Brown Tail Moth scouting work in the province of New Brunswick was completed by the end of January without the discovery of any winter nests of this insect. In Nova Scotia, however, 757 nests were collected, the majority of these being found in the Bridgetown, Round Hill and Torbrook districts. Local outbreaks have occurred at the above points during the past five years.

The new Dairy Building at the Ontario Agricultural College will be equipped with the most modern and best dairy appliances for investigation and instruction work. In addition to an increased dairy staff, the sciences of dairy chemistry and bacteriology will be looked after by men devoting their whole time to these subjects. The positions of Dairy Chemist and Dairy Bacteriologist have been assigned respectively to Mr. A. L. Gibson and Mr. T. H. Lund of the Chemistry and Bacteriology departments.

The Department of Farm Management at the Ontario Agricultural College is planning investigations into marketing problems. The initial step in this direction has been the appointment to the staff of Mr. R. D. Colquette (1915) who has studied co-operative marketing both on this continent and in Europe. It is likely that the marketing of dairy products will first be given attention, with extention eventually to all kinds of farm produce. Mr. Colquette will be given a professorship, but the precise title has not yet been determined.

The growth of the Boys' and Girls' Club movement in the United States and Canada has been almost phenomenal and the work is still in its beginnings. It is interesting to note that the movement has spread to Great Britain. The first club in England was formed at Henyodk in Devonshire, and more recently, clubs have been formed at Kingsclere, Newbury, in Hampshire, and at Welwyn, Hertfordshire.

A report recently given out by the Dairy Commissioner of Saskatchewan shows that during the year 1921 there were fifty-five creameries in operation in the province and the total output of creamery butter from these was 7,085,000 lb. with value of \$2,609,000. 1921 was the first year the creamery output of Saskatchewan reached the seven million mark, and above figures show an increase of nearly 7 per cent over 1920. There was also an increase of nearly 50,000 milk cows in the province, and the total value of dairy products was more than eighteen and three-quarter million dollars. This is a very considerable drop in value from total products of the previous year, but this is reported as due to a decrease in the average market values which have obtained for dairy products during the year and not to a decrease in production.

The Saskatchewan Rural Education Association, of which there are now 175 branches in active operation, continues to be the most efficient organization to carry the school exhibition and Boys' and Girls' Clubs. These activities are now recognized as the most important departments of the Rural Education Association.

The Saskatchewan Live Stock Associations instituted a new feature this year in connection with their annual meetings in holding a Boys' and Girls' Stock Judging Contest covering the judging of all classes of live stock. The No. 1 team from Indian Head captured the grand aggregate silver shield presented by the Bank of Montreal. In addition each boy received a gold medal.

A special train under the auspices of the Provincial Department of Agriculture, will tour Alberta in an effort to stir up greater interest in hog industry and especially in the bacon hog. The train will be equipped to demonstrate dairying, bacon, hog production and other branches of agriculture.

ASSOCIATIONS AND SOCIETIES

CENTRAL CANADA VETERINARY ASSOCIATION

At the annual meeting of the Central Canada Veterinary Association the following officers were appointed for the ensuing year: Honorary presidents: Drs. J. G. Rutherford and F. Torrance, Ottawa, C. D. McGilvray, Toronto, and D. McAlpine, Brockville; president, Dr. George Hilton, Ottawa; vice-president, Dr. J. A. Bean, Winchester; honorary patron, Hon. W. R. Motherwell, Minister of Agriculture; honorary members, Drs. J. A. Amyot, Deputy Minister, Department of Health; W. J. R. Fowler, Toronto, Hon. S. F. Tolmie, British Columbia; A. J. C. Hood, Food Inspector, Montreal; George A. Dauth, principal Laval Veterinary School, Montreal; and Rev. J. A. Lindsay, Ottawa; secretary-treasurer, Dr. C. H. Weaver, Ottawa.

BRITISH COLUMBIA FRUIT GROWERS' ASSOCIATION

The British Columbia Fruit Growers' Association's Convention was held in Victoria in January. The association recommended the establishment by the Dominion government of an experimental station in southwest Kootenay, and that stations also be established for experimenting with and testing fertilizers. Among the more important matters dealt with were the codling moth danger and the tariff on imported fruit.

C. E. Barnes, Walhachin, was re-elected president, and Professor Barss, of the University of British Columbia, Vancouver, secretary-treasurer.

NOVA SCOTIA FRUIT GROWERS' ASSOCIATION

The 58th annual meeting of the Nova Scotia Fruit Growers' Association was held at Bridgetown in January last and was well attended. Among those in attendance were: W. T. Macoun, Dominion Horticulturist, Ottawa; J. A. Ruddick, Cold Storage Commissioner of Canada; C. W. Baxter, Fruit Commissioner, Ottawa; B. Leslie Emslie, Consulting Agricultural Chemist; Dr. Cumming and Prof. Truman of the Agricultural College, Truro; Prof. W. S. Blair, Experimental Station, Kentville, N.S.; Prof. Geo. E. Sanders and Prof. W. H. Brittain.

The subject of pre-cooling of fall apples before shipping aroused much interest,

resulting in a resolution asking the Dominion and provincial governments to make provision for experimental work.

The following officers were elected for the ensuing year: President, G. H. Vroom, Middleton; vice-president, J. Elliott Smith, Wolfville; secretary, F. W. Foster, Kingston.

NIAGARA PENINSULA FRUIT GROWERS, LIMITED

The Niagara Peninsula Fruit Growers' Association at its annual meeting elected the following officers for 1922: Hon. President, J. P. Bridgeman, Winona, Ont.; President, Arthur Onslow, Niagara-on-the-Lake; Secretary-Treasurer, C. E. Fisher, St. Catharines.

DAIRYMEN'S ASSOCIATION OF WESTERN ONTARIO

The Dairymen's Association of Western Ontario held its 55th annual convention at London, Ont., in January. Resolutions were passed pledging the association's support to any suitable legislation to make cream grading compulsory in Ontario; asking for the exclusion of oleomargarine; endorsing the Dominion Butter-Scoring contest and the market despatches issued by the Dairy and Cold Storage Commissioner; pledging the association's support to any satisfactory system of grading dairy products for export introduced by the Dominion Department; endorsing the federal and provincial campaigns for the elimination of the scrub dairy sire, and seconding departmental effort on behalf of cow-testing. J. N. Allen, Dunnville, Ont., was elected President. Secretary-Treasurer, F. Herns, London.

NOVA SCOTIA DAIRYMEN'S ASSOCIATION

The Nova Scotia Dairymen's Association at its ninth annual convention at Antigonish in January elected the following officers for 1922: President, R. T. Stewart, Scotsburn; Vice-President, John E. Falt, Antigonish; Secretary, W. A. MacKay, Truro.

THE DAIRYMEN'S ASSOCIATION OF EASTERN ONTARIO

At the annual meeting of the above association, held at Ottawa in January last, the following were the officers elected for the year 1922: President, M. N. Empy, Napanee; 1st Vice-President, William Newman, Lorneville; Secretary, T. A. Thompson, Almonte.

THE AGRICULTURAL GAZETTE OF CANADA

Resolutions were passed urging the prohibition of the manufacture and sale of oleomargarine; approving of the Dairy Standards Act; approving of the work of the Department of Agriculture looking to the elimination of scrub and inferior dairy herd sires; recommending that all creameries value butterfat on the cream basis; endorsing Government grading of dairy products for export.

NATIONAL DAIRY COUNCIL

The National Dairy Council of Canada held its annual convention at Winnipeg. Resolutions were passed (1) For revision and reduction in freight and express rates for milk and milk products; (2) Advising against the importation and sale of milk substitutes.

President for 1922, E. H. Stonehouse, Weston, Ont.; Secretary-Treasurer, D'Arcy Scott, Ottawa.

NEW BRUNSWICK FARMERS' AND DAIRY-MEN'S ASSOCIATION AND NEW BRUNSWICK DAIRYMEN UNITED

The forty-sixth annual convention of the New Brunswick Farmers' and Dairymen's Association was held at Moncton, N.B., January 17-20, and in conjunction with the session of January 18 was held the third annual convention of the New Brunswick Dairymen United. The Provincial Seed Exhibition and the Cheese and Butter Show were held simultaneously. There was a large attendance at all these gatherings.

President, Thos. W. Riordan, Riordan, Gloucester County; Corresponding Secretary, Alex. J. Doucet, Notre Dame, Kent County.

NOVA SCOTIA FARMERS' ASSOCIATION

At the annual convention of the Nova Scotia Farmers' Association held at Pictou in January, Mr. Walter Churchill, Yarmouth, was elected President for 1922. Secretary, Chas. R. B. Bryan, Truro.

MANITOBA LIVE STOCK ASSOCIATIONS

The Live Stock Associations for the province of Manitoba held their annual convention at Brandon in January and elected the following officers for 1922:

Cattle Breeders' Association: President, John Strachan, Pope, Man.

Horse Breeders' Association: President, J. W. Reid, Brandon.

Swine Breeders' Association: President, D. W. Agnew, Brandon.

Manitoba Sheep Breeders' Association: President, John Strachan, Pope, Man. Secretary of the above associations: W. I. Smale, Brandon, Man.

Manitoba Shorthorn Club: President, C. W. McMillan, Newton Siding; Secretary, John Strachan, Pope.

BRITISH COLUMBIA POULTRY ASSOCIATION

The following are the officers of the British Columbia Poultry Association for 1922: President, Rev. C. McDiarmid, Victoria; Secretary and Manager, Mrs. E. Mottley, Kamloops; Secretary-Treasurer, J. R. Terry, Victoria.

CANADIAN GUERNSEY BREEDERS

At the annual meeting of the Canadian Guernsey Breeders' Association held at Amherst, N.S., the following officers were elected: President, J. F. Roper; 1st Vice-President, J. A. McSloy; 2nd Vice-President, Alex. McKay; Secretary-Treasurer, H. W. Corning.

MARITIME POULTRY ASSOCIATION

The annual meeting of the Maritime Poultry Association elected the following officers for 1922: President, Samuel McKee, Moncton; Vice-President for N.B., R. P. Allen, Fredericton; Vice-President for N.S., W. A. Seaman, Truro; Vice-President for P.E.I., A. F. Houston, Charlottetown; Secretary-Treasurer, A. Vye Gibson.

MARITIME BEEKEEPERS' ASSOCIATION

At the annual meeting of the Maritime Beekeepers' Association the election of officers resulted as follows: President, J. Artemus Clark, Charlottetown, P.E.I.; Vice-President for N.S., Boyd Johnson, Amherst; Vice-President for N.B., Mr. H. C. Miller, Fredericton; Vice-President for P.E.I., Allen Newson, Charlottetown; Secretary-Treasurer, E. G. Craig, Kentville, N.S.

ONTARIO EXPERIMENTAL UNION

At the forty-third annual meeting of the Ontario Agricultural and Experimental Union held at the Ontario Agricultural College, Guelph, in January, the following officers were elected for 1922: President, J. W. Widdifield, M.P.P., Uxbridge, Ont.; Vice-President, J. Baker, Solina, Ont.; Secretary and Editor, Dr. C. A. Zavitz, O.A.C., Guelph.

THE AGRICULTURAL GAZETTE OF CANADA

Dr. C. A. Zavitz made the following statements in his annual report:—

In co-operative experiments conducted for four years, excellent results have been obtained in the use of the dry formaldehyde treatment for the prevention of oat smut. This is a comparatively simple treatment and one which is likely to be adopted quite generally.

In 1921, crop tests were made with "nitro-bacter soil vaccine," which has been extensively advertised. So far no special advantage has resulted from the use of this material.

Definite methods of eradicating some of the worst weeds in Ontario have been formulated and tested out on numerous farms under the direction of the Experimental Union Committee on Agricultural Botany. The weeds that have received special attention so far have been, perennial sow thistle, bladder campion, wild mustard, twitch grass, and wild oats.

Of the seven varieties of corn recommended by the Ontario Corn Growers' Association, the Golden Glow has given the highest average yield of grain per acre in the co-operative experiments in each of five out of the last six years.

The O. A. C. No. 181 variety of field peas which was originated at the Ontario Agricultural College through hybridization, and which was sent out in the spring of 1921 for the first time, surpassed each of three other leading varieties by about four bushels per acre.

Numerous co-operative experiments with fertilizers and manures on farm crops have been conducted. Commercial fertilizers have given more decided results with turnips, mangels and potatoes than with oats, winter wheat, or even corn.

FIELD HUSBANDRY ASSOCIATION, SASKATCHEWAN

At the annual meeting of the Saskatchewan Field Husbandry Association held at Saskatoon in January the officers elected for 1922 were: President, E. G. Booth, Seamans; 1st Vice-President, M. P. Tullis, Field Crops Commissioner, Regina; Secretary-Treasurer, Professor Manley Champlin, College of Agriculture, Saskatoon. The purpose of this association is to carry on field experimental work in the province. Any farmer interested in this work may enroll as a member and take part in the work. An experiment immediately under way is the growing of crops in rows as a substitute for the summer fallow. The association is also interested in the production and sale of choice seed.

Canadian Sheep Breeders' Association.—At the Annual convention of the Canadian Sheep Breeders' Association, the following officers were elected for 1922: President, H. Follett, Duval, Sask.; Vice-president, J. D. Brien, Ridgetown, Ont.; Secretary-Treasurer, R. W. Wade, Toronto.

Dominion Shorthorn Breeders' Association.—The officers elected for 1922 are as follows:—Honorary President, J. G. Barron, Carberry, Man.; President, H. M. Pettit, Freeman, Ont.; First Vice-President, Hon. Duncan Marshall, Olds, Alta.; Second Vice-president, John Gardhouse, Weston, Ont.; Secretary-Treasurer, Geo. E. Day, Guelph, Ont.

Manitoba Dairy Association.—The annual convention of the Manitoba Dairymen's Association, held at Winnipeg, was attended by delegates and exhibitors from Manitoba, Saskatchewan and Alberta. The exhibit of butter was of a high standard, showing a distinct improvement over the year previous. The judges were C. P. Marker, Calgary, and Geo. H. Barr, Chief, Dairy Division, Ottawa.

The officers for 1922 include, E. Fotheringham, Brandon, Man., President, and L. A. Gibson, Winnipeg, Man., Secretary-treasurer.

Ontario Swine Breeders' Association.—The Ontario Swine Breeders' Association at its annual meeting re-elected its officers for 1922 as follows:—President, M. St. Marie, Leamington; Vice-president, W. F. Wright, Glanworth; Secretary, J. E. Rettie, Department of Agriculture, Toronto.

Ontario Vegetable Growers' Association.—At the annual meeting of the Ontario Vegetable Growers' Association the following officers were elected:—President, G. H. Food, London, Ont.; Vice-president, W. H. Stewart, Aylmer, Que.; Secretary-Treasurer, J. Lockie Wilson, Toronto.

Ontario Horticultural Society.—At the annual meeting of the Ontario Horticultural Society held at Toronto resolutions were adopted by the convention urging the passing of a Dominion Registration and Standards Act, and approving the proposed Dominion Horticultural Exhibition.

Officers elected for 1922:—President, Rev. W. M. McKay, Weston; First Vice-president, J. P. Jaffray, Galt; Second Vice-president, J. E. Carter, Guelph; Secretary, J. Lockie Wilson, Toronto.

Canadian Jersey Cattle Club.—President, Gordon Duncan, Todmorden, Ont.; Vice-President, F. E. M. Robinson, Richmond, Que.; Secretary-Treasurer, Bartley Bull, Brampton, Ont.

Saskatchewan Shorthorn Club.—Hon. President, Dean Rutherford, Saskatchewan University; President, R. A. Wright, Drinkwater; Vice-President, V. M. Ross, Regina.

Saskatchewan Clydesdale Breeders Association.—President, Peter A. Taylor, Arcola; Vice-President, Jack Byers, Valjean; Secretary, N. D. Mackenzie, Indian Head.

Saskatchewan Cattle Breeders' Association.—President, R. A. Wright, Drinkwater; Vice-President, W. D. Lyon, Devon; Secretary, J. G. Robertson, Department of Agriculture, Regina.

Saskatchewan Belgian Club.—President, George Rupp, Lampman; Vice-President, R. Thomas, Grandora; Secretary, E. Hogden, Halbrite.

Saskatchewan Hereford Association.—President, W. N. Catley, Craven; Vice-President, W. S. Shore, Cupar; Secretary, W. H. Harrison, Hyde.

Saskatchewan Horse Breeders' Association.—President, James Dougans, Condie; Vice-President, Geo. Rupp, Lampman; Secretary, J. R. Robertson, Regina.

Saskatchewan Sheep Breeders' Association.—President, G. N. Buffum, Bechard; Vice-President, Olaf Berg, Loreburn; Secretary, J. G. Robertson, Regina.

Saskatchewan Swine Breeders' Association.—President, C. W. Thurston, North Regina; Vice-President, C. M. Learmonth, Regina; Secretary, J. G. Robertson, Regina.

APPOINTMENTS AND STAFF CHANGES

Mr. Duncan Marshall, former minister of agriculture for Alberta, has been appointed Commissioner, Dominion Department of Agriculture. Mr. Marshall will make an investigation into the advisability of continuing or amending the Agricultural Instruction Act. He will report as to any changes he may find necessary in the amounts to be paid, methods of calculating such amounts, the scope of the work of the provinces under the act, and similar matters. His appointment also carries with it the commission to inquire into such other agricultural problems as may be necessary and desirable.

Mr. Grant S. Peart, B.S.A., formerly Chief of Seed Markets Intelligence, has been promoted to the position of Chief of Markets and Fertilizer Division, effective from January 1. In addition to his former duties Mr. Peart will have charge of feed and fertilizer markets reporting and will supervise the administration of the Fertilizers Act, which was transferred to the Seed Branch as from April 1 last.

Mr. J. Sidney Dash, who for the past few months has been investigating certain tobacco diseases for the Tobacco Division of the Experimental Farms Branch, has been appointed Supervising Seed Analyst to the Seed Branch of the Dominion Department of Agriculture.

Mr. R. W. Reek has resigned his position as Assistant to the Dominion Live Stock Commissioner to take charge of the Western Ontario Experimental Farm which is to be established by the Ontario Department of Agriculture at Ridgetown. Mr. Reek was born on a farm in Kent county and is therefore acquainted with local conditions and problems. He graduated from the Ontario Agricultural College about ten years ago and was afterwards in the employ of the Ontario Department of Agriculture for a few years in different capacities, including some time spent in the office in London, England. Returning, he served for some years in Eastern Canada, being in charge of the agricultural work in Prince Edward Island for a few years and then becoming Deputy Minister of Agriculture for New Brunswick for a further period. The latter position he resigned to take the position of Assistant Live Stock Commissioner at Ottawa, which position he held until the present time.

Mr. E. H. Strickland, who since his return from overseas has spent three summers in Alberta combating grasshopper outbreaks, is resigning from the staff of the Entomological Branch to take the position of Professor of Entomology at the University of Alberta, where he will be in a strong position to further the science of entomology in Canada.

Mr. George E. Sanders, who was in charge of the insecticide investigations with headquarters at Annapolis Royal, N.S., has resigned his position on the staff of the Entomological Branch of the Dominion Department of Agriculture to engage in commercial insecticide work.

Mr. James Bremner has recently been appointed Live Stock Superintendent for the province of New Brunswick, succeeding Mr. J. H. King, who has returned to the Moncton office as Agricultural Representative. Mr. Bremner was previously the Agricultural Representative at Chatham and at Moncton.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTER- NATIONAL INSTITUTE BRANCH, DEPART- MENT OF AGRICULTURE, OTTAWA

The genus Iris, by W. R. Dykes. Cambridge, University Press, 1913. 245 pp. col. plates.

Logements des animaux. Part IV. Basses-cours, chenils, ruchers, magnaneries, par M. Ringelmann. Paris, Librairie agricole de la maison rustique, 1922. 160 pp. il.

Essays on agriculture, by S. D. Babbitt and L. C. Wimberly. Toronto, Doubleday, Page & co. 1921. 349 pp.

The respiratory exchange of animals and man, by August Krogh, Ph.D. New York, Longmans, Green & co. 1916. 173 pp. diagrams. (Monographs on biochemistry, ed. by R. H. A. Plimmer).

The federal system of the Argentine Republic, by L. S. Rowe, Ph.D., LL.D. Washington, Carnegie Institution, 1921. 161 pp. (Pub. 258).

Rubber-content of North American plants, by H. M. Hall and F. L. Long. Washington, Carnegie Institution, 1921. 65 pp. plates. (Pub. 313).

Aeration and air content; the role of oxygen in root activity, by F. E. Clements. Washington, Carnegie Institution, 1921. 183 pp. Bibl. pp. 163-183. (Publication 315.)

Contributions to embryology. Washington, Carnegie Institution, 1921. Vols. X & XII. 103, 364 pp. col. plates. (Publications 275 & 293.)

Leodicidae of the West Indian Region, by A. L. Treadwell. Washington, Carnegie Institution, 1921. 131 pp. il. col. plates. Bibl. pp. 128-9. (Publication 293.)

Index of economic material in documents of the States of the United States; Pennsylvania, 1790-1904. Part II. F to Railroads, by A. R. Hasse. Washington, Carnegie Institution, 1921. 147 pp. (Publication 85.)

Displacement interferometry applied to acoustics and to gravitation, by Carl Barus. Washington, Carnegie Institution, 1921. 149 pp. (Publication 310.)

An introduction to cytology, by L. W. Sharp. N. Y. McGraw-Hill book co. inc. 1921. 452 pp. diagrams. Bibliographies at ends of chapters. (Agricultural and biological publications, ed. by C. V. Piper.)

Darwin & after Darwin, by G. J. Romanes, M.A., LL.D., F.R.S. Chicago, Open court publishing co. 1910-1916. 3 vols. il.

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The kiln drying of lumber, by H. D. Tieemann, M.E., M.F. 3d ed. Montreal, J. B. Lippincott co. 1920. 318 pp. diagrams.

Shantung—Treaties and agreements. Washington, Carnegie endowment for international peace, 1921. 120 pp.

Outer Mongolia—Treaties and agreements. Washington, Carnegie endowment for international peace, 1921. 39 pp.

Manchuria—Treaties and agreements. Washington, Carnegie endowment for international peace, 1921. 220 pp.

Korea—Treaties and endowments. Washington, Carnegie endowment for international peace, 1921. 68 pp.

The limitation of armaments, by Dr. Hans Wehberg. Washington, Carnegie endowment for international peace, 1921. 104 pp.

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The Sino-Japanese negotiations of 1915. Washington, Carnegie endowment for international peace, 1921. 76 pp.

Detection of the common food adulterants, by E. M. Bruce; 3d. ed. N.Y. D. Van Nostrand co. 1917. 88 pp.

National education association of the U.S. Addresses and proceedings... Washington, 1921. 883 pp. (Vol. 59.)

Plymouth Rock standard breed book, by A. C. Smith. Chicago, 1919. 438 pp. illus.

The nut culturist, by A. S. Fuller. N.Y. O. Judd co. 1919. 289 pp. il.

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The new rhubarb culture, by J. E. Morse. N.Y. O. Judd, 1918. 130 pp. il.

Bulbs and tuberous rooted plants, by C. L. Allen. N.Y. O. Judd, 1920. 311 pp. il.

Heredity, by J. A. Thomson, M.A. 2d ed. N.Y. G. P. Putnam's sons, 1913. 627 pp. il.

Fruit farming on the "dry belt" of British Columbia, by J. S. Redmayne, M.A. new and revised edition. London, Times book club, 1912. 132 pp.

The study of the weather, by E. H. Chapman. Cambridge, University Press, 1919. 131 pp. illus.

Building plans for modern homes, by F. H. Gowing. Boston, 1921. unpage.

Clean milk, by S. D. Belcher, M.D. N.Y. O. Judd co. 1916. 145 pp. illus.

Dwarf fruit trees, by F. A. Waugh. N.Y. O. Judd co. 1920. 125 pp. illus.

Hedges, windbreaks, and live fences, by E. P. Powell. N.Y. O. Judd co. 1918. 140 pp. illus.

Wealth & freedom, by Richard Higgs. Dover, Dover printing and publishing co. 1920. 256 pp.

Silver-fields and other sketches of a farmer-sportsman, by R. E. Robinson. Boston, Houghton Mifflin co. 1921. 261 pp.

Feeds and feeding manual, by E. S. Savage and F. B. Morrison. Milwaukee, Wis. 1921. 167 pp.

Asparagus, by F. M. Hexamer. N.Y. O. Judd co. 1920. 168 pp. il.

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Handbook of horticulture & viticulture of Western Australia, by A. Despeissis, M.R. A.C. 3d ed. 647 pp. il.

A day in a colonial home, by Della R. Prescott, ed. by John Cotton Dana. Boston, Marshall Jones co. 1921. 70 pp. il.

Fruit farming; practical and scientific... by Cecil H. Hooper. 2d ed. London, Lockwood press, 1921. 212 pp. illus.

The desert and the rose, by E. N. Ellison. Boston, Cornhill co., 1921. 215 pp. illus.

Canadian grain trade year book, 1920-21. Winnipeg, W. S. Evans statistical service, 1922. 77 pp.

The wheat plant, by John Percival. London, Duckworth, 1921. 463 pp. illus.

Diseases of the small domestic animals, by O. V. Brumley, V.S. N.Y., Lea & Febiger, 1921. 672 pp.

Germination in its electrical aspect, by A. E. Baines. N.Y., E. P. Dutton & co., 1921. 185 pp. il.

Farm management, by R. L. Adams. N.Y., McGraw-Hill co. inc. 1921. 671 pp. il.

La distribution géographique des animaux, par W. L. Trouessart. Paris, Librairie Octave Doin, 1921. 332 pp. il.

Efficient marketing for agriculture, by T. Macklin. Toronto, Macmillan co. of Canada, 1921. 418 pp. il.

Soils, by E. W. Hilgard. Toronto, Macmillan, 1906. 593 pp. il.

The complete garden, by A. D. Taylor, M.S.A. Toronto, Doubleday Page & co., 1921. 440 pp. il.

Studies of a plant-lover, by Elizabeth W. Perry. Cincinnati, Ebbert & Richardson, co., 1921. 400 pp. il.

Raspberry growing in Scotland, by J. M. Hodge. Edinburgh, Scottish small holders' organization, 1921. 120 pp. il.

Parasites végétaux des plantes cultivées, par Louis Mangin. Paris, Librairie agricole de la maison rustique, 1921. 159 pp.

The little garden, by Mrs. Frances King. Boston, Atlantic monthly press, 1921. 94 pp. illus.

A manual of microscopy, by L. K. Darbaker, Ph.D. Pittsburgh, 1920. 215 pp. illus.

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Check list of the plants contained in Gray's manual, by Mary A. Day. Cambridge, 1908. 168 pp.

A manual of histological pharmacognosy and bacteriology, by L. K. Darbaker, Ph.G. Pittsburg, 1921. 506 pp.

Animal and vegetable oils, fats and waxes, by G. Martin, D.Sc. London, Crosby, Lockwood & son, 1920. 218 pp. il.

A research on the eucalypts and their essential oils, by R. T. Baker. Sydney, 1920. 471 pp. illus.

The farm bureau movement, by O. M. Kile. Toronto, Macmillan, 1921. 283 pp. il.

Farm management, by F. W. Card. Toronto, Doubleday, Page & co., 1920. 270 pp. il.

Church co-operation in community life, by P. L. Vogt. N.Y., Abingdon press, 1921. 171 pp.

Rural organization. Washington, American country life association, 1921. 237 pp.

Immigration and the future, by Francis Kellar. N.Y., Doran, 1920. 276 pp.

Community civics, by W. E. Ames, M.A. and Arvie Eldred, B.A. Toronto, Macmillan co., 1921. 387 pp. il.

Sylvan Ontario, by W. H. Muldrew. Toronto, William Briggs, 1901. 67 pp. il.

The one-man poultry plant, by Dr. W. N. Sanborn. Syracuse, Depuy, 1916. 64 pp. il.

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The conservation of textiles, by H. G. Elledge and A. L. Wakefield. La Salle, Ill. Laundry owners national association, 1921. 162 p.

The book of cowboys, by F. Rolt-Wheeler. Boston, Lothrop, Lee & Shepard co., 1921. 394 pp. il.

Successful family life on the moderate income, by M. H. Abel. Montreal, J. B. Lippincott co., 1921. 251 pp.

An introduction to social psychology, by William McDougall. Boston, J. W. Luce & co., 1913. 389 pp.

Options and futures, by J. C. McMath. Chicago, G. I. Jones, 1921. 70 pp.

Boy activity projects, by S. A. Blackburn. Peoria, Ill., Manual arts press, 1918. 143 pp.

Trapping, by W. L. Arnold. Guilford, Me., 1921. 51 pp. il.

The Airedale terrier, by E. W. Baker. N.Y., Field & fancy pub. co., 1921. 98 pp. il.

The conservation of the wild life of Canada, by C. Gordon Hewitt, D.Sc. N.Y., Charles Scribner's sons, 1921. 344 pp. il.

Motor truck manual. Cincinnati, American automobile digest, 1921. 148 pp. il.

Federal farm loan system in operation, by A. C. Wiprud. N.Y., Harper & bros., 1921. 280 pp.

Everyday civics, by C. E. Finch. N.Y., American book co., 1921. 326 pp. il.

War government of the British Dominions, by A. B. Keith, D.C.L. N.Y., Humphrey Milford, 1921. 353 pp.

Australia unlimited, by E. J. Brady. Melbourne, George Robertson & co., 1921. 1130 pp. il.

Practical stone masonry self-taught, by F. T. Hodgson. Chicago, F. J. Drake & co., 1907. 486 pp.

Sewers & drains, by A. Marston, C.E. Chicago, American technical society, 1917. 197 pp. il.

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Standard poultry for exhibition, by J. H. Robinson. Quincy, Ill. Reliable poultry publishing co., 1921. 176 pp. il.

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SASKATCHEWAN

Eleventh Annual Report of the Director of Agricultural Extension, 1920-21.—Contains account of the work of the Agricultural Societies.

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PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty,
International Institute Commissioner, Department of Agriculture,
West Block, Ottawa.

CROPS AND CULTIVATION

124.—Damage to Crops by Weather in the United States.—WARREN SMITH J., in *Monthly Weather Review*, Vol. 47, No. 8, pp. 446. Washington, August, 1920.

The following table gives the average damage per cent to crops in the United States due to different factors or unfavourable weather conditions:—

It appears from the data available that the total amount of actual potash imported or produced in the United States in 1920 was approximately the same as in 1913, the actual figures being 240,000 tons in 1920 and 237,437 tons in 1913. In 1920 there were imported 1,480,503 short tons of sodium nitrate as compared to a total of 659,600 short tons

	Deficient Moisture	Excessive Moisture	Floods	Frost or Cold	Hail	Hot Winds	Storms	Total Weather	Plant Diseases	Insect Pests	Animal Festu-	Defective Seed	Total
Wheat.....	12.4	2.0	0.3	4.5	1.1	2.0	0.3	22.9	2.7	2.1	0.2	0.2	28.8
Maize.....	16.3	4.0	0.9	2.9	0.4	2.2	0.5	27.7	0.2	2.7	0.2	0.7	32.1
Oats.....	2.7	0.3	0.8	0.8	1.9	0.4	20.8	1.7	0.9	0.1	0.2	0.2	24.5
Barley.....	17.2	1.8	0.1	0.8	1.3	3.2	0.4	24.9	1.7	0.7	0.3	0.1	28.7
Flax.....	21.1	1.3	0.1	4.0	1.7	3.0	0.2	31.8	2.2	0.9	0.1	0.3	36.4
Rice.....	6.7	3.1	1.3	0.3	0.7	0.4	1.8	14.1	1.2	0.8	0.3	0.1	19.0
Potatoes.....	14.4	3.1	0.2	1.6	0.1	0.7	0.1	20.7	4.4	3.2	0.1	0.3	30.0
Tobacco.....	8.7	3.7	0.6	1.1	0.8	0.2	0.3	15.8	0.4	2.6	0.1	0.1	30.5
Hay.....	13.4	1.7	0.3	1.7	0.1	0.6	0.2	18.4	0.1	0.5	0.1	0.1	20.4
Apples.....	5.4	1.6	0.2	14.6	0.8	0.5	0.9	24.9	3.7	3.6	0.1	0.1	39.6
Berries.....	9.3	1.7	0.2	7.3	0.5	0.6	0.2	20.3	1.1	0.6	0.1	0.1	24.9
Cotton.....	12.3	4.3	1.0	1.4	0.5	1.6	0.7	22.3	2.0	9.7	0.2	0.2	35.3

125.—Frost and the Prevention of Damage by it.—*Farmer's Bulletin* No. 1096, United States Department of Agriculture, pp. 3-48. Washington, D.C., April, 1920.

A description of the actual effect of frost on soil and vegetation, followed by a discussion of various methods and devices now being used for protection purposes, and the temperatures injurious to plants, blossoms and fruits, with special reference to citrus fruits.

THE FERTILIZER SITUATION.—U.S. Senate, 66 Congress, 3, Sess., Doc. 410 (1921). 27 pp.

This document consists of a letter from the Secretary of Agriculture, transmitting a statement on the fertilizer situation in the United States, in response to a Senate resolution of January 26, 1921. Data are included on the amount of commercial potash, nitrogen, and phosphoric acid available for fertilizer purposes and the price of each of these articles as compared with the prices for 1913.

imported in 1913. The opinion is expressed that in view of the subnormal buying power for the spring season of 1921 the stocks on hand were sufficient for deliveries and contracts for the entire year of 1921.

It is estimated that about 490,000 tons of ammonium sulphate were produced in the United States in 1920, and that considering imports and exports there were about 50,000 tons in the hands of the producers, and about an equal amount of contract material in the hands of the fertilizer manufacturers. The domestic consumption of ammonium sulphate, including domestic production and imports in 1913, is estimated as 260,775 short tons.

A probable production of about 70,000 tons of fish scrap in 1920 is estimated as compared with the 1913 production of 68,705 tons. The amount of cottonseed meal produced in 1920 is estimated to be around 2,288,000 tons, while the amount produced in 1913 was estimated at 2,220,000 tons. It is estimated that in the period from July

1, 1917, to June 30, 1918, about 34.9 per cent of the total tonnage of cottonseed meal and cake produced in the United States was used for fertilizer. No figures were available for the production of animal tankage, dried blood, and similar slaughterhouse products in 1920.

The data available indicate that the production of acid phosphate in 1920 was around 4,500,000 tons as compared with approximately 4,000,000 tons produced in 1913.

The data on prices of fertilizer materials in 1920, as compared with 1913, show that the prices for 1920 were in all cases higher than for 1913. In some cases, notably phosphates and potash, the prices were much higher, but in other cases only slightly so. Suggestions are given for relief of the situation in case the amount of any or all of the materials discussed is insufficient or the price prohibitive.

12.—The Phosphoric Acid in Sandy Humiferous Soils and in their Solutions.—BRIOUX, Ch., in the *Annales de la Science Agronomique*, Series 6, 1920, pp. 80-86. Paris, 1920.

In normal, non-acid soils with an average humus content, the phosphoric acid is usually present in the form of tribasic calcium phosphate associated with a small quantity of iron phosphate and alumina; a third part is combined with the black matter of the soil, and as a result of nitrification, is gradually placed at the disposal of the plants in a much divided form that is easily assimilated. On the other hand, the water surrounding the soil particles normally dissolves but very little of the phosphates, so that, as a rule, the solutions circulating in the soil and providing the plants with food, only contain some tenth parts of a milligramme of P_2O_5 per litre, and rarely more than 1 to 2 mgm., even when the soil is very fertile; but the experiments of Th. Schlesinger have demonstrated that these small quantities, which are continually renewed, are sufficient to ensure the complete development of maize grown in nutritive solutions.

The phosphoric-acid content of soil solutions is constant for any given soil, and M. Dumont explains its variations in different soils by the variable composition of the humates and humo-phosphates present in them.

This suggestion seems to be borne out by the experimental results obtained by the author, showing that the high P_2O_5 content of the solutions of certain soils is connected with the presence of a large amount of humic matters together with a deficiency in lime.

These experiments were carried out upon humiferous, sandy soils composed of a coarse sand consisting entirely of silica, and which were originally yellowish, but from repeated

manuring, had assumed the blackish hue characterizing humiferous soils. They had an acid reaction, and were very poor in potassium and lime, and very rich in P_2O_5 .

From his experiments, the author draws the following conclusions:

In the case of sandy, humiferous soils without lime, the phosphoric-acid content of the soil solution appears to depend upon 3 factors, which are, in descending order:—(1) Lime content; (2) amount of black matter; (3) total phosphoric-acid content.

As soon as the lime content falls below 2 per 1,000, the humo-phosphates can begin to dissolve to a noticeable extent in the water surrounding the soil particles.

Sandy humiferous soils enriched by very intensive cultivation are capable of giving solutions containing far more phosphoric acid than is generally recognized, and certain losses of black matter and of phosphoric acid may be due to the action of drainage water.

In order to derive most advantage from such soils, the first thing to do is to add lime, which will precipitate the humus more thoroughly on the particles of sand and will give more stability to the phosphatic compounds. The lime will also promote nitrification and facilitate the double decompositions taking place between the fertilizers and the soil. It is equally necessary to add potash which is usually lacking in this type of soil.

Quick or slaked lime would be too violent in its action, and is best replaced by lime compost and, when possible, by soft chalky lime, more or less finely pounded, as its chemical action is in direct proportion to its fineness. The author obtained excellent results by adding to these sandy, humiferous soils 1,800 lb. of pulverized chalk refuse per acre, together with potassic fertilizers.

131.—Effect of Alfalfa on the Subsequent Yields of Irrigated Field Crops.—SCOFIELD, C. S., in *United States Department of Agriculture, Bulletin No. 881*, pp. 1-13. Washington, D.C., August 10, 1920.

Report of experiments carried out at 3 different Stations in the northern Great Plains, to ascertain the extent of the beneficial effect of growing alfalfa in rotation with Irish potatoes, oats and sugar beets growing on irrigated land. The trial tests covered a period of 6 years. Comparison is also made between these crop yields when grown in the same sequence but without alfalfa. A further comparison is made in the case of potatoes and sugar beets, as to the relative effect of alfalfa in rotation and the application of farm yard manure at the rate of 12 tons per acre, once during the period of rotation.

Results showed that when the soil is a light sandy loam, the effect of alfalfa has been to increase the yields per acre as follows:—potatoes about 100 bushels, oats about 6 bushels, sugar beets 3.4 tons.

On heavy clay loam rich in organic matter, no beneficial effect was apparent, and the effect on oats and sugar beets was too slight to be regarded as significant.

On a very productive clay loam, the increase in yields per acre showed:—for potatoes about 50 bushels, without, however, increasing the proportion of marketable potatoes, which was relatively high on all the plots, oats about 11 bushels, and sugar beets about 1.5 tons.

While these results do not show a strikingly beneficial effect from the use of alfalfa in the rotation in the case of oat yields, it should be noted that these crops were grown on soil that was virgin at the beginning of the experiment and of relatively high productivity as shown by the mean yields of all the plants included in the experiment. In the case of sugar beets the alfalfa appeared nearly as beneficial as the periodical applications of manure, even although the position of the beet crop in the alfalfa rotation was not so favourable as in the manured rotation. While both manure and alfalfa have increased the yield, the size of the beet, and the vigour of growth as expressed in the larger proportion of tops, there has not been a corresponding increase in the percentage of sugar in the beets.

22.—The Influence of Cold in Stimulating the Growth of Plants.—COVILLE, F. V., in the *Proceedings of the National Academy of Sciences of the United States of America*. Vol. 6, No. 7, pp. 434-435. Easton, Pa., July, 1920.

The author gives contradictory evidence to the general belief that native trees and shrubs become dormant because of the cold, and that warm weather is in itself the sufficient cause of the beginning of new growth in spring.

Dormant trees and shrubs which had had two or three months of chilling, either outside or in artificial cold storage, started into growth in the normal manner in the spring, but if kept warm all the winter they did not start into growth at the usual time but continued their dormant condition for weeks and months, and sometimes for a whole year. When finally growth commenced it was of an abnormal character. One of these dormant plants was found to be readily started into healthy growth even after a year, by subjecting it to a period of chilling. The best temperature for chilling was 32° to 40° F., applied either in light or darkness. By subjecting one part of a dormant bush to a chilling temperature and keeping another

part of it warm, the chilled portion was brought into full leaf and flower while the other part remained completely dormant.

During the process of chilling, the starch stored in the cells is transformed into sugar and this is necessary before the plant can utilize its store of starch in making spring growth. If warmth alone would start growth, the stored food required by the plant for its normal vigorous growth the following spring would be wasted in a burst of new autumn growth, which would be killed by the first heavy frosts and cause ensuing weakness and probable death.

Further investigations are urged, especially in the determinations of the proper temperatures for the storage of different kinds of seed, bulbs, cuttings and grafting wood; for the treatment of plants which are to be forced from dormancy to growth at unusual seasons, and for the storage of nursery stock so that the nurseryman may have plants in proper condition for shipment at any date.

26.—The Nitrogenous Matter and Phosphoric Acid present during the Maturation and Germination of Wheat.—ROUSSEAU, E., and SIROT, in the *Comptes rendus de l'Academie des Sciences*, Vol. CLXXI, pp. 578-580. Paris, September 27, 1920.

In their previous work on the baking qualities of flour the authors have shown that in the flours made from normal, completely ripe and properly harvested wheat, the ratio of the soluble nitrogen to the total nitrogen present is almost constant in good baking flours. In flours that take badly, the proportion of soluble nitrogen varies from this constant.

Subsequently, they estimated the variations in the nitrogen, phosphoric acid and acid contents, not only of the flours but also of the wheat itself. Analyses were made of average samples of wheat gathered every five days in the same field from the setting of the grain until the harvest; and then seeds from the beginning of germination until the emergence of the seedling. The results may be summarized as follows:

The total nitrogen varies little; it increases and then decreases slowly and slightly as the carbohydrates increase. If, however, the percentage of the total nitrogen varies but little, the conditions under which it exists differ greatly. At first, 40% of the nitrogen is soluble, but its solubility gradually decreases till only 9% is soluble. At this point, a fresh slight increase of solubility manifests itself, and 3 or 4 days later, an almost stable condition of equilibrium is reached, the proportion of soluble nitrogen being about 14%. This stable condition appears to coincide with the chemical maturation that appears to precede the harvest

by a fortnight. The ratio of soluble nitrogen to total nitrogen remains about 14%, as long as the condition of the wheat is normal, but should it begin to germinate, the amount of soluble nitrogen rapidly increases rising to 26% in the distended, germinating seed, and to 52% in the embryo itself.

The behaviour of the phosphoric acid is in every way similar to that of the nitrogen; the percentage is at first almost uniform, but falls from 76 to 30% to rise slowly to, and remain at about 35%. In the germinating seed, it increases rapidly to 42%.

The parallelism in the variations of the nitrogen and phosphoric acid is not without practical interest. It is possible to admit a correlation between a scarcity of available nitrogen in soils, and the low gluten content of wheats with a heavy yield, but it appears that this could not be remedied by the increased application of easily nitrifiable nitrogenous fertilizers, unless a large supply of phosphatic manures were given at the same time.

During maturation, the acidity distinctly and regularly falls, declining from 0.300 to 0.016 to rise again to 0.048 in the germinated grain.

To sum up, wheat reaches normal and complete maturity when a state of equilibrium is reached, which as far as the nitrogenous and phosphatic matters are concerned, consists in the existence of a certain ratio between the soluble and insoluble materials. Any other ratios denote insufficient maturation, or a tendency to germination, which means that the condition of the wheat, or the flour, is more or less unsuitable for bread-making.

40.—The Artificial Production of Vigorous Trees by Hybridization.—HENRY, A., in *Quarterly Journal of Forestry*, Vol. XIV, No. 4, pp. 253-257. Bibliography of 6 works. London, Oct., 1920.

For several years the author has been making experiments in the production of new trees by hybridization, in the hope of obtaining fast-growing kinds that would produce timber rapidly. A considerable number of such trees have occurred accidentally, and among them may be mentioned the Lucombe Oak, the Huntingdon Elm, the Black Italian Poplar, the Cricket Bat Willow, and the London Plane. These all show the striking feature of first crosses in the difference of the rate of their growth from that of the parent species. These hybrids of the first generation, in trees as in other plants, are remarkable for their size, rapid growth early and free-flowering, the ease with which they can be multiplied, and in all probability their comparative immunity from disease. Impressed with these

facts, the author urged in 1910 that the artificial production of trees by crossing was a new and important field of research.

It is a popular belief that fast-grown timber is necessarily soft and comparatively worthless. This a fact in most conifers; but in one class of broad-leaf trees, the wood of which is characterized by large pores in the inner part of the annual ring, the contrary is true, as the faster the timber of these trees is grown the stronger and denser it becomes. This class includes oak, ash, chestnut, hickory and walnut, the species in fact that, par excellence, produce the most valuable timber.

The difficulty of growing the ordinary species of oak, ash and walnut is the long period required for their maturity, which renders hopeless, except on the best soils, all chance of an adequate financial return. Without vigorous first crosses, the most valuable classes of timber can only be grown in limited quantity.

Immunity from diseases might be expected in some, if not all, first crosses. In the case of ordinary species, individuals of great vigour are undoubtedly less liable than weaklings to the attacks of most fungi, and are probably less sought after by insects like Chermes and Aphis. In this way, the Dunkeld hybrid Larch (*Larix eurolepis*, A. Henry) may prove immune to Dasyscypha. There is also a possibility of obtaining hybrids, capable of thriving on certain classes of soil, as chalk and peat, on which ordinary kinds of trees cannot be properly grown.

An important question is the propagation of these vigorous crosses once they are created. The first cross does not come true from seed and can only be multiplied by vegetative reproduction. This is easy when the trees are readily propagated by cuttings, as in the case of poplars and willows, or by layers, like the Huntingdon and Belgian elms. We may resort to grafting low on stocks, which should be seedlings of one or other parent.

No explanation has yet been offered in the author's opinion as to the real cause of the extraordinary vigour displayed by hybrids. The vigour is distributed over the whole plant, and is as conspicuous in the roots as in the stem and leaves. What we actually observe is not only an acceleration of, but also an increase of cell-division in all parts of the plant. The cells divide very quickly, continue to divide, and thus build up a taller stem, a more extensive root-system, etc. It is possible that the stimulus which causes growth (i.e., cell-division) to commence and to continue is some soluble compound or enzyme. Whether the amount of vigour in hybrids is directly associated with the degree of relationship between the individuals that are crossed is a disputable

point, but one of practical interest in the selection of parents for crossing experiments. One of the author's most vigorous hybrids *Populus generosa*, is derived from two parents so little related that they are placed in two distinct sections of the genus. A cross between two races of the common alder shows considerable vigour, though the parents can only be distinguished by the most trivial characters. The fact, if established, that different races when crossed give vigorous progeny could be turned to practical account in plantations and forests where natural regeneration is looked for. The introduction of a few lines of the Riga variety into a plantation of native Scots Pine might ultimately (as pollination would be affected by the wind), give seedlings of enhanced vigour.

The production of hybrid trees can be undertaken with the best chances of success in southerly stations, where numerous species happen to be cultivated. If hybridization is tried on a commercial scale, lofty green houses and ladders will be required for the protection and easy handling of the flowers of many species.

Very little has actually been done in hybridization of forest trees. Klotzsch started work in this direction in 1845 at Berlin. He crossed four pairs of species, all common trees (pine, oak, alder and elm), and after eight years the hybrids averaged one-third better than the parents. We next hear of artificial hybridization of trees in California, the most notable being the production of the Royal and Pardox hybrid Walnuts, by Burbank. The statements currently made in books about these are gross exaggerations; nevertheless, there was considerable increase of growth. The original Royal Walnut, produced by a cross actually made in 1878, was measured by Shull in 1907, and found to be 50½ ft. in height and 26 inches in diameter breast high. The author's experiments, carried out in 1909-1914, produced several interesting hybrids, the most remarkable being *Populus generosa*. Subsequent experiments in hybridization carried out at Kew during the war have resulted in the production of numerous seedlings of ash from various crosses that were carefully made, the parent species being *Fraxinus excelsior*, *F. americana*, *F. pennsylvanica* and *F. oregona*. In no case can one detect the slightest difference between the seedlings and the mother parent, and it seems then as if this is an example of that Bateson calls monolepsis. The occurrence of this phenomenon in *Fraxinus* is very embarrassing and would seem at first sight to put a stop to all chance of obtaining true hybrid ash trees. In nature, however, there are cases where hybrids occur, but occur with great rarity, the conditions for their production being unknown. In the case of the ash, the experiments ought to be multiplied and be

carried out on a very extensive scale in some place where pollen of numerous species would be available. The author suggests Washington, D.C. as the best locality.

The financial advantage of producing a hybrid ash is obvious, but may be simply illustrated as follows. Grant that on a certain soil the common ash attains the requisite size and suitable for felling at 70 years old, and that the hybrid ash, quicker in growth, equals this at 56 years old. Assuming the rate of interest to be 5 per cent which means the doubling of capital in 14 years, it will be readily seen that the hybrid ash in this case is twice as productive as the common ash. The doubling of the value, is an object worth considerable outlay in experiment, and in the author's opinion the artificial production of hybrid trees ought to be taken up seriously and arrangement be made for the establishment of a station for this research either in France or in the United States. This station might be internationalized.

41.—The Electrification of Seeds by the Wolfry Process.—SUTTON, M. H. F., in *Sutton and Sons, Bulletin No. 11*, pp. 1-7, Reading, 1920.

A series of tests were carried out with seeds of mangold, swede, cattle cabbage and carrot to compare the percentage of germination and the crop values from seed:—(1) untreated (2 control plots); (2) treated by the Wolfry process; (3) immersed in salt solution; (4) immersed in sulphate of ammonia solution; in the two last cases, 4 oz. per gallon solutions and subsequently dried at a temperature of 100°F. The purpose of the experiment was to ascertain if the process is sufficiently beneficial as regards results to justify the expense entailed, and also if the benefit is due only to this process or if equally satisfactory results can be obtained through immersion alone.

Germination Test.—Notwithstanding the one or two points which appeared slightly in favour of the electrified seed, the general results could only be regarded as inconclusive. The mangold seed (electrified) showed the highest germination, but was closely followed by the seed immersed in sulphate of ammonia solution. The untreated seed with carrot and cabbage stood first in the final results.

Field Test.—On light loam on a gravelly subsoil; in 1918 dressed with farmyard manure and cropped with lettuces, endives, etc.; no manure in 1919. In this case also the mangold electrified seed gave the more marked result and a slightly higher yield than any of the other tests.

In no case was the plant from electrified seed observed to appear above ground in advance of the others. With regards to the other crops, reviewing the outdoor tests as a whole the results hardly appeared conclusive, the returns from the electrified seed showing no distinct advantage over the other sections.

149.—Methods for Differentiating between the Seed of Mangolds and Sugar-Beets.—
PIEFER, H., in *Zietschrift des Vereins des Deutschen Zuckerindustrie*, No. 1919; reproduced in *Deutsche Landwirtschaftliche Presse*, No. 1, pp. 3-4, 1920.

In most cases, the *glomerulae* of the mangold can be readily distinguished from those of the sugar-beet after germination (not before), by the colour of the plumule, above and below ground, by the radicle leaves, etc.

It is sufficient therefore to conduct germination tests by burying the seeds 2 cm. deep in small receptacles containing garden soil, exposed to diffused light, covered with sheets of glass (uncoloured) and at a temperature of 15°C. After 8 days, when the first shoots appear the sheets of glass should be removed, and the seedlings watered, if necessary. After 2 or 3 weeks, the seedlings are 2 to 3 cm. high and the process is ended.

For examination purposes, the seedlings are pulled up whole and examined individually on a black plate, comparing them with seedlings possessing definite characters proper to the sugar-beet.

In the sugar-beets, the hypocotyl is colourless and the epigeal portion is generally (80%) rose-coloured or greenish white (some 20%).

In mangolds with yellow or orange coloured roots, the stems are either entirely yellow, or distinctly orange, with slight shades.

In mangolds with red roots, the stems are distinctly carmine in colour, which increases in intensity from the first foliage leaves downwards.

The only mangolds which may be confused with sugar-beets are those with white roots and the Lank variety, owing to the similarity in stem coloration.

45.—Early Varieties of Wheat and Oats.—
SEVERIN, R., in the *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VI, No. 25, p. 640. Paris, July 7, 1920.

With the idea of completing, in the order of ripening, the series of early wheats that are rust-resistant in the climate of the Gironde, the author presented to the Academie, after Pusa No. 4, Hindi and Pereal Toti, type ears of 3 varieties of the same order and suitable to arid soils of average fertility and to the rudimentary methods of dry farming, as these wheats can grow with as little as 11 to 14 inches of rain. These

wheats are of average productiveness and are adapted to producing early crops, for they ripen earlier than rye and all the native wheats (semi-winter), or to extra-late spring-sowing, when the crop ripens at the same time as autumn wheats. They can also be grown in summer, in order to compensate for any deficiencies in the normal harvest by a new autumn crop. They are as follows:—

(1) Awnless "Cedar Wheat", of Hindoo origin, selected by the Agricultural Station of Berkeley, California. Its straw is short, fine, flexible, resistant to lodging, and the red, glutinous grain is characterized by a dorsal furrow.

(2) Awned "Propo" wheat, of very vigorous growth, strong tillering and regular yield. Its narrow leaves, the flexible straw that bends under the weight of the ears, all contribute to form the pendant tufts that characterize its habit. The grain is whitish, and gives a lemon flour much prized for fancy baking and pastry making.

(3) Chinese wheat (introduced by Versin of Orleans in 1918) has an awned, cylindrical, ear, which is short and blunt, and packed with coloured grain emerging from the glumes; the grain is dry and semi-glutinous. This variety is characterized by such a capacity for tillering that it may be said to bear two crops a year.

The author subsequently presented 2 samples of awnless, Schirbaux Ligowo X Brie oats (1) The Ligowo X Brie oat cultivated in Gironde has no awns, as has been found on growing it in summer and spring for two years. He also showed the "Liberty" variety of oat, which was obtained by Prof. Saunders (Cerealist of the Dominion of Canada). It is awnless, which makes it much in request by the oatmeal industry, and, in addition, very early.

50.—Perennial Rye Grass and Wild White Clover.—GILCHRIST, PROF., in *The Journal of the Ministry of Agriculture*, Vol. XXVII, No. 7, pp. 674-677. London, Oct., 1920.

A lecture emphasizing three important points in grassland improvement: (1) the benefits following the inclusion of wild white clover (*Trifolium album*) in seed mixtures; (2) the value of perennial rye grass and the proper method of retaining and developing this grass; (3) the improvement of turf which results from proper treatment of grass.

I.—After many years' experience the mixture used for three-year leys on poor clay with excellent results was as follows: 16 lb. perennial rye grass, 10 lb. cocks foot (*Dactylis glomerata*), 4 lb. timothy (*Phleum pratense*), 4 lb. late flowering red clover, 1 lb. trefoil and 1½ lb. wild white clover per

acre. The rotation was a six course one and since 1912, five of the 3 year leys were reported as producing in the first, second and third years, 42 cwt., 45 cwt., and 38 cwt., per acre respectively. The unusual results were said results to be due to the inclusion of the white clover.

The clover aftermaths were found most valuable for grazing and in consistently good condition, and the turf at the end of the 3 years was always excellent.

On poor stiff clay soil of low value an addition of 4 lb. wild white clover gave an average crop of hay for eleven years of 34 cwt. per acre compared with $23\frac{1}{2}$ cwt. without this addition.

With regard to the treatment of the leys, a good seed bed is advocated as being of the greatest importance. The only manure used throughout the whole experiment was 10 cwt. per acre of basic slag. This was applied to the young seeds as soon as possible after the barley crop was harvested on the 3-year leys, and every third year on the above mentioned poorer soil.

The inclusion of late flowering red clover in the mixture was due to clover sickness to which the ordinary red clover is more readily addicted.

II.—The lecturer explains that previous failure with perennial rye grass was due largely to the absence of close grazing and heavy treading by stock. Several instances are quoted showing that by paying due attention to these two points, the more nutritious will be the pasture and the more numerous the head of grazing stock which it will carry.

To illustrate the improvement of turf which follows the treatments outlined, specimens indicated that: (1) Unmanured turf consisted mainly of poor wiry bent fescue grasses, stunted and starved wild white clover plants, and 2 inches of dead organic matter, and underneath an apparently worthless soil; (2) treated with basic slag and closely grazed with cattle showed instead an abundance of perennial ryegrass and other good grasses, and a luxuriant growth of wild white clover. The subsoil was a good sandy loam, dark in colour with rich organic matter and moisture.

159.—Low Temperatures in Floriculture.—MARINO, A., in the *Rivista del Freddo*, Year VI, No. 8, pp. 277-278. Rome, Aug., 1920.

From the Floricultural point of view the chief points of interest for the refrigerating industry are:—(1) To be able to retard the growth and, consequently, the flowering of plants; (2) to be able to preserve the flower as long as possible.

The following facts have been deduced from practical observations:

The lily-of-the-valley flowers quickly, and arrives at maturity, about three weeks after being taken from the refrigerator. Spirea matures in 6 or 7 weeks, *Azalea mollis* Bl. (*Rhododendron molle* G. Don) in 5 or 6 weeks. The different species of *Lilium* (*longifolium*, *auratum*, and *tenuifolium*) flower, the first after 13-15 weeks, the second after 16-18 weeks, the third after 18-20 weeks. *Lilium longifolium*, potted in the summer, flowers in 16-18 weeks. Usually, lily bulbs potted after the middle of September flower, 1, 2 or 3 weeks after, according to the time of potting, but this should not be later than the second week in November.

The temperatures to which the young plants can be subjected vary. *Lilium candidum* bulbs will stand—2°-2°C., those of *Lilium longifolium* must be kept at a constant temperature which should not exceed 15°C., and when they bear shoots the temperature should be raised to 18°C., in the greenhouse and 21°C. in the sun. *L. auratum* bulbs can be kept in drained pots with dry earth at 13°C. until they sprout, then at 20°C., until they flower.

The lilac and lily-of-the-valley (rhizomes and young plants) should be kept at a minimum temperature of —8°C. and at a maximum of —5°C. Rose trees can be kept from November to March at 6-10°C.; they can thus be kept from the frosts and all growth is stopped until spring is well advanced.

Dutch hyacinth bulbs are kept at 0.5°C. The hygrometric degree at which bulbs, rhizomes and young plants are usually kept is from 80-90%. In the case of cut flowers the facts are as follows:

Astrea keeps well for 35 days, at a hygrometric degree of 85%. Chrysanthemums 45 days, with 90% or more humidity.

The iris is difficult to keep, and resists at most for 12 days at 2°C. with 85% of relative humidity.

The hyacinth keeps well for more than a month at 2°C. and 85% relative humidity. White lilac keeps better than the coloured varieties; about 30 days.

Lilies (especially *L. candidum*) when not quite open, keep 30 days at 2°C. with 80% hygrometric degree. Narcissi, violets and tulips keep more than a month, better as buds or slightly closed, at 3°C. and 85% relative humidity.

The rose shows little resistance to cold, but buds will keep 8 days at 2°C. and 85-90% relative humidity.

The flowers for conservation should be plucked on days that are neither too hot nor too dry, and put into the refrigerator immediately.

LIVE STOCK AND BREEDING

71.—Inoculating Cattle against Tuberculosis.—CALMETTE, A., and GUERIN, C., in the *Annales de l'Institut Pasteur*, Vol. XXXIV, No. 9, pp. 553-560. Paris, September, 1920.

The experiments carried out by the authors from 1912-1915 revealed the following facts:—

(1) By means of successive series of cultures of the bacillus of bovine tuberculosis a race of non-tuberculigenous bacilli can be obtained that are perfectly tolerated by cattle and other animals susceptible to the virus of tuberculosis.

(2) This non-virulent race behaves as a true vaccine, in that, when injected in the right amount into the veins of cattle, it makes these animals immune, not only against experimental test inoculation, but also against infection due to living in close quarters in a contaminated shed.

(3) This immunity, which presumably depends upon the presence of the non-virulent bacilli in the organism, only lasts 18 months after vaccination, but it can be conferred again by annual vaccination, a process which in itself is quite harmless.

RURAL ECONOMICS

92.—The 1921 Wheat Crop in Great Britain.—MIDDLETON, SIR T., in *The Journal of the Ministry of Agriculture*, Vol. XXVII, No. 5, pp. 224-427. London, Aug., 1920.

There is a widespread impression not only that the British wheat grower contributes a trifling amount to the total food supply, but that any effort made to increase the wheat crop would have negligible results. The author however disagrees and lays stress on the importance of home grown wheat and the fact that this contributes more to the food supply of the United Kingdom than any other farm product, with the exception of milk and potatoes.

Estimations as to the nation's resources were made during the war, and it was then discovered that about 42% of the food was home produced, the chief items in this percentage being: dairy produce 8.3; potatoes 7.4; wheaten bread 6; beef 4; and meat of all kinds 10.5. About 5 million tons of imported feeding stuffs were used in stock feeding, and if the amount of meat and milk made from these is subtracted the total percentage derived through meat and milk from native soil would be reduced to 16.

If 78% of the cultivated land is required for the production of meat and milk which

between them provide about 42% total food stock from soil, it should also be noted that wheat occupies 4% only of the cultivated land, and wheaten bread accounts for 16% of the stock of food grown on the soils. Wheat offals and straw also contribute to the meat and milk supply; before the war less than 70% of the grain was made into bread. Hence the importance of growing more wheat. The land even now devoted to this purpose produces seven times as much food per acre to that employed in stock farming.

The change in the relationship between producers and consumers is very marked since the war, and an increase in home supplies is obviously essential. The rise in the cost of American wheat which has taken place during the last few months is due to a cause which has a peculiar significance for the British farmer. The total wheat crop of Canada, the United States and Argentina 1909-13 averaged 28,200,000 tons; in 1915, 44,100,000 tons, and an average production of 33,520,000 tons in 1915-19, and last season's harvest, 36,700,000 tons. The American effort made up for the loss of the Russian crop. It should however be noted that in 1920 the United States practically returned to its pre-war acreage and the total yield expected is 22,000,000 tons as against 25,600,000 last year and 18,700,000 in 1909-13.

But the United Kingdom is the greatest purchaser of wheat and the United States grows all the wheat she needs and a little more. There is therefore evident necessity in developing the supplies in the former country, now freed from war conditions and limitations. Extensive autumn sowing has therefore been urged.

210.—Payment for Milk according to its Fat Content.—PORCHER, C., and VITOUX, E., in the *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VI, No. 38, pp. 916-923. Paris, Dec. 15, 1920.

In certain countries milk is bought at a price in proportion to the fat content. The authors maintain that purchase on this basis is insufficient and ought to be supplemented by a factor relating to the quantity of dry fat extract. For this two very simple tests are sufficient, the first being the total fat content determined by the Gerber method and the second, the density of the milk. In addition the "freshness" of the milk (microbial qualities and cleanliness) must be taken into account. The determination of the acidity of the milk, a usual dairy process, gives an approximate measure of the microbe content of the milk.

216.—Influence of Fermentation on the Starch Content of Experimental Silage.—DOX, A. W., and YODER, L., in the *Journal of Agricultural Research*, Vol. XIX, No. 4, pp. 173-179, Bibliography of 13 works. Washington, D.C., May 15, 1920.

The work reported was undertaken to determine any changes the starch might undergo together with the nature of these changes and their relation to other important reactions occurring in silage fermentation. The experiments were made with field maize still green, dented and about at its glazing stage. Determinations were made for moisture, total acidity, alcohol, total sugar and starch, and qualitative tests were also made for the transitional products of starch hydrolysis, namely, soluble starch and dextrins.

From the results obtained the author drew the following conclusions:—

Changes in total acidity, alcohol, and sugar are entirely independent of the starch content of the ensiled maize of the silage produced therefrom.

The silage solution, the medium in which fermentation takes place, which is in contact with the silage starch granules, reached a $N \cdot 04$ concentration by the 8th day and almost $N \cdot 05$ by the 66th day. Most of this acidity was due to lactic and acetic acids. Strong acids must, according to this, be used and their dilute solutions must be heated. That there was no marked maximum production of alcohol at any time was due probably at first to oxidation of the acetic acid and later to esterification. Unless the rate of fermentation equals the rate of formation of sugar, no formation of sugar from higher carbohydrates, will be indicated after the 8th day.

The first intermediate products resulting from the decomposition of starch were not present in demonstrable quantities. The starch content remained constant throughout the fermentation process, and the granules remained intact, undergoing no physical change that could be detected by microscopic examination. The lack of consistency in the variations and their correlation with the other fermentation changes gives further evidence that the starch is not changed.

Since starch constitutes about 10% of the maize plant at the time of ensiling, and represents over 400 calories of available energy per kg., the fact that no loss occurs during fermentation is an additional argument according to the authors, in favour of silage as an economical food.

PLANT DISEASES

221.—The International Convention for the Control of Locusts concluded in Rome, on October 31, 1920.

A conference for the purpose of organizing the international control of locusts was convened under the auspices of the International

Institute of Agriculture by the Italian Government with the support of the French Government, and met in Rome, at the said Institute, on October 28, 1920.

The representatives of the following States took part in the proceedings:—Argentina, Belgium, Bulgaria, China, Cuba, Egypt, Spain, French West Africa, Algeria, Indo-China, Madagascar, Morocco (French zone), Tunis, United Kingdom, Canada, Greece, Hungary, Italy, Erythrea, Italian Somaliland, Tripolitania, Cyrenaica, Mexico, Paraguay, the Kingdom of the Serbo-Croato-Slavonians, and Uruguay. Canada was represented by T. K. Doherty, Institute Commissioner.

The conference concluded its labours by drawing up the text of the following Convention, which will bear the fixed date of Oct. 31, 1920:—

Art. I.—The contracting States pledge themselves to take all necessary measures for the control of locusts that may injure the crops of such neighbouring states as are signatories of the present convention.

Art. II.—They shall at once take adequate measures to inform the neighbouring signatory States of the movements of locusts under the circumstances mentioned in Art. I.

Art. III.—They shall be empowered to make special agreements in their mutual interest as to the common measures to be adopted for facilitating the control of locusts.

Art. IV.—They recognize, from the date of the signing of the present convention, the International Institute of Agriculture, Rome, as the International Official Centre for the recording and transmission of all information referring to the control of locusts.

They undertake to furnish to the said Institute, at least once a year, and oftener, if occasion requires, all the information, of a technical, scientific, legislative, and administrative character collected on this subject by competent persons.

The International Institute of Agriculture shall disseminate such information as widely and rapidly as possible.

Art. V.—Any suggestion emanating from a Contracting State, and dealing with a modification of the present convention, shall be communicated by the said State to the International Institute of Agriculture, and shall be referred by the latter to a meeting of the Delegates of the Contracting parties which shall be convened in Rome by the International Institute of Agriculture, on the occasion of a General Assembly at the said Institute.

The proposals made by the Delegates shall at once be submitted to the approval of the States adhering to the present convention.

Art. VI.—The present convention shall be signed and ratified as soon as possible,

and the ratifications shall be consigned to the Italian Government as soon as three at least of the contracting states shall have been able to execute them.

Each ratification shall be communicated by the Italian Government, both to the other contracting States, and to the International Institute of Agriculture.

Art. VII.—Any self-governing State, Dominion, or Colony that has not yet signed the present convention may become an adherent to it on request.

Colonies, on the request of the States of which they are dependencies, are admitted as adherents on the same conditions as sovereign States.

Art. VIII.—Their adherence shall be notified through diplomatic channels to the Italian Government, and shall be communicated by the latter to the contracting Governments as well as to the International Institute of Agriculture.

Art. IX.—The present Convention shall come into force, at least as regards the three first States ratifying it, within three months from the date of ratification; and as regards the other States, within six months from the date of the consignment to the Italian Government of the document embodying their ratification or adhesion.

The present Convention has been signed by the Plenipotentiaries of the States:—Argentina, Bulgaria, Cuba, France, French West Africa, Algeria, Indo-China, Mada-

gascar, Morocco (French portion), Tunis, Hungary, Italy, Erythrea, Italian Somaliland, Tripolitania, Cyrenaica, Mexico, Kingdom of Serbo-Croato-Slavonians, Uruguay, and Greece.

104.—The Take-All or Foot-Rot Disease of Wheat (*Ophiobolus graminis*) in New York State.—KIRBY, R., and THOMAS, H. E., in *Science*, new series, Vol. LII, No. 1346, pp. 368-369. Lancaster, Pa., Oct. 15, 1920.

Early in July 1920, at East Rochester, New York, attention was attracted to a small area in a field of soft red winter wheat, where the plants were badly dwarfed and prematurely dead. In many cases secondary culms had been killed soon after their formation. The roots of the plants were rotted and usually broken near the base of the culm; the lower internodes were dark or entirely blackened and enveloped by a dense sheath-like plate of thick-walled brown mycelium. This plate was formed between the leaf sheath and culm. Perithicia in considerable numbers were found embedded in the leaf sheath and mycelial plate. Microscopic measurements of these and ascospores agree very closely with those given by Saccardo for *Ophiobolus graminis*.

As soon as the fungus was identified, steps were taken to determine the source of the infection and to completely eradicate the disease from the infected area.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

1.—Agriculture in Persia (Persian Products, Rich and Varied Resources).—*The Times Trade Supplement*, Vol. V, No. 79, p. 435. London, 1920.

2.—Nutritive Value of the Proteins of Barley, Oat, Rye and Wheat Kernels.—OSBORNE, T. B., MENDEL, B., and WAKEMAN, A. S., in the *Journal of Biological Chemistry*, Vol. XLI, No. 3, pp. 275-306. Baltimore, March, 1920.

8.—Agricultural Climatology of Australia.—TAYLOR GRIFFITH, in *Quarterly Journal of the Royal Meteorological Society*, Vol. XLVI, No. 196, pp. 331-356. Bibliography of 7 works. London, Oct., 1920.

18.—The Industrial Utilization of the Locust.—SCHUGURENSKY, L., in the *Revista de Centro Estudiantes de Agronomia y Veterinaria de la Universidad de Buenos Aires*, Year XIII, No. 99, pp. 13-17. Buenos-Aires, April, 1920.

20.—The Potash Salts of Upper Alsace and their Utilization in Colonial Agriculture.—CHEVALIER, A., in the *Bulletin agricole de l'Institut Scientifique de Saigon*, Year II, No. 10, pp. 289-297. Saigon, Oct., 1920.

29.—Studies on Self-Sterility.—EAST, E. M. (Harvard University) in *Genetics*, Vol. 4, No. 4, pp. 341-363, Bibliography of 7 titles. Princeton, New Jersey, July, 1919.

40.—The Artificial Production of Vigorous Trees by Hybridization.—HENRY, A., in *Quarterly Journal of Forestry*, Vol. XIV, No. 4, pp. 253-257, Bibliography of 6 works. London, Oct., 1920.

42.—Classification and Detailed Description of Some of the Wheats of Australia.—*Commonwealth of Australia, Institute of Science and Industry, Bulletin No. 18*, pp. 1-48. Melbourne, 1920.

64.—A Policy of Forestry for the Nation in the United States.—GRAVES, H. S., *United States Department of Agriculture, Circular 148 Office of the Secretary*, pp. 1-11. Washington, D.C., 1919.

76.—The Mechanical Power Required for Crushing Oil-Cakes as a Factor in their Selection.—RINGLEMANN, in *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VI, No. 28, pp. 704-707. Paris, Oct. 6, 1920.

80.—Intensive Production of Baby Beef in France.—LAPLAUD, in *Comptes rendus de l'Academie de l'Agriculture de France*, Vol. VI, No. 33, pp. 795-798, and 802-808. Paris, November, 10, 1920.

83.—The Goats of the Mediterranean Countries.—MANETTI, C., in *l'Agricultura coloniale*, Year XIV, No. 9, pp. 367-376. Florence, September, 1920.

89.—New Agricultural Implements.—LARUE, P., in *La vie agricole et rurale*, Year 9, Vol. XVII, No. 45, pp. 278-279. Paris, Nov. 6, 1920.

91.—A New Hay-Loader.—MANRIN, G., in *the Journal d'Agriculture pratique*, Year 84, No. 42, pp. 316-317. Paris, Oct. 14, 1920.

108.—Notes on Spotting of Apples in Great Britain.—HORNE, A. S., and HORNE, E. V., in *The Gardener's Chronicle*, Vol. LXVIII, 3rd Series, No. 1766, pp. 216-217. London, Oct. 30, 1920.

123.—Mathematical Enquiry into the Effect of Weather on Maize Yield in the United States.—WALLACE, H. A., in *Monthly Weather Review*, Vol. 48, No. 8, pp. 439-446. Washington, August, 1920.

126.—The Choice and Use of Instruments for Measuring Radiation in Agricultural Climatological Researches.—VALLOT, J., in *the Comptes rendus de l'Academie des Sciences*, Vol. 170, No. 12, pp. 720-722. Paris, March, 1920.

134.—Researches upon the "Flowerless" Apple-Tree.—LONGO, B., in the *Atti della R. Accademia dei Lincei Serie Quinta, Rendiconti Classi di Scienze fisiche, matematiche e naturali*, Vol. XXIX, Part 9, pp. 290-291. Rome, Nov. 7, 1920.

138.—Respective Roles Played by the Bases, Potash, Lime and Magnesium, in Cultivated Plants.—LAGATU, H., in the *Comptes rendus de l'Academie des Sciences*, Vol. CLXXII, No. 2, pp. 129-131. Paris, Jan. 10, 1921.

139.—Method for Measuring the Transpiration of Living Plants.—FREEMAN, G. F., in *The Botanical Gazette*, Vol. LXX, No. 3, pp. 190-216. Chicago, Sept., 1920.

143.—The Inheritance of Glume Length and Grain Length in a Wheat Cross.—ENGLEDOW, F. L., in *Journal of Genetics*, Vol. X, No. 2, pp. 110-132. Bibliography of 18 works. London, August, 1920.

166.—British Empire Forestry Conference.—*Quarterly Journal of Forestry*, Vol. XIV, No. 4, pp. 265-294. London, Oct., 1920.

175.—Observation on the Body Temperature of Dry Cows.—KRISS, M., in *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 6, No. 8, pp. 539-541. Washington, D.C., Sept., 1920.

190.—The "Excelsior" Motor Plough.—DESSAISAIIX, R., in the *Journal d'Agriculture pratique*, Year 84, No. 52, pp. 514-515. Paris, Dec. 23, 1920.

194.—Agricultural Accounting in Norway during 1918 and 1919.—*Tidsskrift for det Norske Landbruk*, Year XXVII, Part 8, pp. 312-319. Christiania, Aug., 1920.

202.—Variations in the Composition of Wheat.—LINDET, ROUSSEAU, E., and SIROT, in the *Comptes rendus de l'Academie d'Agriculture de France*, Vol. VI, No. 31, pp. 753, 754, 758-762. Paris, Oct. 27, 1920.

212.—Neutralization of Cream.—Rate and Amount of Reaction in Certain Pasteurizers.—RAMSAY, A. A., in *Science Bulletin No. 17, Department of Agriculture, New South Wales*, pp. 3-22. Sydney, May, 1920.

214.—Production and Sale of Wool in Argentina.—In the *Revista de la Asociacion rural del Uruguay*, Year XLIX, No. 7, pp. 501-504. Montevideo, July, 1920.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the August-September and October, 1921 numbers of the Institute Economic Bulletin. Persons interested in any of the articles may obtain the original bulletin on application to the Institute Branch, Department of Agriculture, as long as the supply for distribution is not exhausted.

AUGUST-SEPTEMBER

The Co-operative Movement in Czecho-Slovakia.—8 pages. This installment deals with the development of agricultural co-operation in the provinces, including the co-operative societies for the use of agricultural machinery, and for the production and distribution of electricity.

The Development of Co-operation in Japan.—18 pages. This is the first installment of a comprehensive article on the subject. It deals first with the origin of co-operation in Japan, and the legislation concerning co-operative societies and their organization. This installment concludes with an account of the general progress of co-operation in Japan from 1900 to 1920.

The National Co-operative Wheat Marketing Scheme in the United States—6 pages. Discusses the origin of the national scheme, the United States Grain Growers, Incorporated, methods of marketing grain, and the organization and finance of the national association.

Rural Credits in Canada.—17 pages. An authoritative article on the subject by Professor W. T. Jackman, of Toronto University. It gives a detailed description of the legislation in the various provinces of Canada under which organized credit facilities have been furnished to farmers. There is also some account of the working out in practice of the different laws.

Earnings and Working Hours of Farm Workers in Scotland.—9 pages. This installment deals with the question of working hours and agreements between farmers' unions with regard to working hours.

The Agrarian Reform in Greece.—11 pages. The article contains data on the territory and population of the country, then deals with

agricultural production, the organization of the agricultural administration, agricultural credit and co-operation, the land system, and the new agrarian laws.

OCTOBER

The Co-operative Movement in Czecho-Slovakia.—16 pages. This, the final installment, deals with the present position of co-operative societies in Czechoslovakia.

Co-operative Land Holding Societies in Italy.—16 pages. Descriptions of the various types of co-operative and holding societies are given. The article then deals with the methods of obtaining credit, the procuring of land to cultivate from private owners and from public lands, instruction in technical questions and management, etc. Statistics showing the progress of the societies are given, and there is an extensive bibliography.

The Agricultural Bank of Paraguay.—8 pages. The Government of Paraguay has provided a well organized system of credit in favour of settlers and of agriculture in general carried out by means of a special organization, the Agricultural Bank, of which the present article gives an account.

The Steps Taken in France During the War to Replace Mobilized Farmers and Farm Workers.—18 pages. Describes the first efforts at organization when the war surprised France in the middle of the 1914 harvest. The article then gives an account of the use made of agricultural labourers drawn from different sources, including: men belonging to the older classes who had been detached for agricultural work, wounded men in course of treatment, students and school-children, prisoners of war, interned civilians, Russian military labourers, colonial labourers, and foreign labourers. Another installment will appear in a later number of the Economic Bulletin.

The Progress of Land Settlement in Australia. 12 pages. The subjects covered in this article are: Land legislation in individual States; Free grants, reservations and dedications; Sales by auction and special sales; Conditional purchases; Leases and licenses; Closer settlement; Resumption by the Crown of alienated lands; Classification of holdings according to size; Total areas of settled lands.

AGRICULTURAL STATISTICS

FOREIGN CROP CONDITIONS

(February 15, 1922.)

United Kingdom.—Almost without exception winter crops germinated well. There is a good, thick plant and the plot is healthy and forward. December was a mild month and favourable to growth. January weather was seasonable, and at the end of the month growing crops were of excellent promise.

France.—The mild temperature and rainy weather of December favoured field work and the progress of vegetation. Attacks of field mice were injurious in some localities. January weather was favourable, and at the end of the month wheat and oats were reported to be in good condition throughout the country. The area sown to winter wheat is officially estimated at 11,860,000 acres against 12,750,000 last year, a decrease of 900,000 acres. The area of winter rye is 2,055,000 acres compared with 2,160,000 acres last year.

Germany.—Showers of rain, hail and snow fell over large areas during December, but proved insufficient to effect any marked improvement in the soil conditions after prolonged dry weather. Winter cereals suffered from early frosts.

Italy.—Germination was regular and uniform in Southern Italy but less satisfactory in the North where continued drought was detrimental. Much needed rains fell in January and the outlook improved.

Bulgaria.—Sowing was hindered by continued unfavourable weather. The area sown in winter wheat is given as 1,840,000 acres against 2,140,000 last year.

Czecho-Slovakia.—Continuous dry weather and frosts in December were unfavourable for winter cereals. There were severe frosts and a lack of snow covering in January.

Roumania.—Severe weather greatly hindered sowing and the wheat crop is expected to be smaller even than last year's.

North Africa.—Unfavourable reports were continued. At the end of January the condition of crops was poor. The area sown to wheat in Algeria is estimated at 1,087,000 acres against 1,950,000 acres last year. The wheat area in Tunis is given as 1,285,000 acres against 1,500,000 in 1921.

India.—At the end of January prospects of the new crops were good throughout the country with the exception of the eastern districts of the Punjab where more rain was wanted. The area to be harvested of the coming wheat crop is 27,739,000 acres, compared with 25,722,000 last year, and a five years' average of 31,142,000 acres.

Argentina.—Fine weather prevailed during harvest, but the production of wheat is reported to be considerably less than at first estimated. The estimate of the 1920-21 crop has been officially reduced from 184,000,000 bushels to 170,000,000. This year's crop was first estimated at 207,000,000 bushels, but latest reports indicate that it may be smaller even than last year's.

Australia.—The weather was favourable during harvest and the quality of the new crop is reported to be good. This year's wheat crop is still estimated as 146,600,000 bushels against 146,800,000 last year.

South Africa.—Some damage was caused by excessive rainfall towards the end of December, but in most districts a good wheat harvest was expected. The new wheat crop is estimated as 8,690,000 bushels against 8,113,000 last year.

THE 1921 CROPS OF CANADA

The following table gives the final estimates of the acreage and production of crops in Canada in 1921 compared with 1920.

Crops	Area		Production	
	1921	1920	1921	1920
	Acres	Acres	Bushels	Bushels
Fall wheat.....	721,000	814,000	15,520,000	19,469,000
Spring wheat.....	22,540,000	17,418,000	285,338,000	243,720,000
All wheat.....	23,261,000	18,232,000	300,858,000	263,189,000
Oats.....	16,949,000	15,850,000	426,233,000	530,710,000
Barley.....	2,796,000	2,552,000	59,709,000	63,311,000
Rye.....	1,842,000	1,650,000	21,455,000	11,306,000
Flaxseed.....	533,000	1,428,000	4,112,000	7,998,000
Corn for husking.....	297,000	292,000	14,904,000	14,335,000
Potatoes.....	702,000	785,000	107,246,000	133,831,000
			Tons	Tons
Fodder corn.....	585,000	589,000	6,362,000	5,642,000
Sugar beets.....	28,000	36,000	268,000	412,000

UNITED STATES FINAL CROP REPORT FOR 1921

The following table contains the final estimates of the crops of the United States in 1921 compared with those of 1920 and 1919. The figures for 1919 and 1920 have been revised in accordance with the census report for 1919.

Crops	1921	1920	1919
	Bushels	Bushels	Bushels
Corn.....	3,080,372,000	3,208,584,000	2,811,302,000
Wheat.....	794,893,000	833,027,000	967,979,000
Oats.....	1,060,737,000	1,496,281,000	1,184,030,000
Barley.....	151,181,000	189,332,000	147,605,000
Rye.....	57,918,000	60,490,000	75,483,000
Flaxseed.....	8,112,000	10,774,000	7,256,000
Rice.....	35,105,000	52,066,000	41,985,000
Potatoes.....	346,823,000	403,296,000	322,867,000
	Tons	Tons	Tons
Hay.....	96,802,000	105,315,000	104,760,000
Sugarbeets.....	7,678,000	8,546,000	6,421,000
	Lbs.	Lbs.	Lbs.
Tobacco.....	1,117,682,000	1,582,225,000	1,465,481,000
Cotton.....	Bales	Bales	Bales
	8,340,000	13,440,000	11,421,000

UNITED STATES WINTER WHEAT

The area sown to winter wheat in the United States is 44,293,000 acres compared with 44,847,000 last year. Weather conditions have been unfavourable, and the crop in the western part of Kansas is in a critical condition. It will not be possible to determine the losses due to winter killing and drought until there has been a period of

growing weather. It is estimated that nearly 50 per cent of the total winter wheat acreage is more or less affected by weather conditions at the present time (February 20). A small yield per acre is expected in Kansas, in which State nearly one-fourth of the winter wheat of the country is grown.

THE AGRICULTURAL GAZETTE OF CANADA

THE WORLD'S LIVE STOCK

CATTLE.

Countries	Recent estimates				Before the war				Difference between pre-war and latest estimates	
	Date	Number	Date	Number	Date	Number	Date	Number	Increase	Decrease
Great Britain.....	June 1921	6,657,002	June 1920	6,712,512	June 1914	7,132,860	.....	.....	145,475	475,858
Ireland.....	June 1921	5,197,120	June 1920	5,022,860	June 1914	5,051,645	.....	.....	2,005,600	2,005,600
France.....	Dec. 1920	12,782,110	June 1919	12,373,660	Dec. 1913	14,787,710	.....	.....	115,867	115,867
Alsace-Lorraine.....	Dec. 1920	435,133	Dec. 1919	415,000	Dec. 1913	551,000	.....	.....	400,259	400,259
Italy.....	.....	.....	April 1918	6,239,741	Dec. 1913	6,040,000	.....	.....	517,717	517,717
Spain.....	.....	.....	June 1918	3,173,577	Dec. 1913	2,878,836	.....	.....	108,457	108,457
Norway.....	.....	.....	.....	1,037,817	Sept. 1914	1,146,274	.....	.....	171,818	171,818
Sweden.....	.....	.....	June 1919	2,550,828	Dec. 1913	2,722,646	.....	.....	128,138	128,138
Denmark.....	.....	.....	July 1920	2,462,408	Dec. 1913	2,462,862	.....	.....	127,990	127,990
Netherlands.....	.....	.....	Mar. 1919	1,968,609	June 1913	2,096,599	.....	.....	362,123	362,123
Belgium.....	.....	.....	.....	1,382,361	Dec. 1913	1,849,484	.....	.....	61,367	61,367
Switzerland.....	April 1920	1,487,361	April 1919	1,433,170	April 1911	1,443,483	.....	.....	.....	.....
Portugal.....	Mar. 1920	1,740,693	.....	.....	Oct. 1906	703,198	.....	.....	37,495	37,495
Germany.....	Dec. 1920	16,789,844	Dec. 1919	16,317,329	Dec. 1913	20,444,000	.....	.....	3,654,156	3,654,156
Czecho-Slovakia.....	Dec. 1920	3,961,830	.....	.....	Dec. 1910	4,342,895	.....	.....	381,065	381,065
Latvia.....	Dec. 1920	730,421	.....	.....	Dec. 1913	912,000	.....	.....	181,579	181,579
Totals, decrease.....	.....	.....	.....	.....	.....	75,165,512	.....	.....	.....	.....
.....
.....
.....
.....
.....
Canada.....	June 1921	10,206,205	June 1920	9,572,196	June 1914	6,036,817	4,169,388	.....	.....	.....
United States.....	Jan. 1922	65,352,000	Jan. 1921	65,587,000	Jan. 1914	56,592,000	8,760,000	.....	.....	.....
Argentina.....	.....	.....	June 1920	27,392,000	June 1914	25,867,000	1,525,000	.....	.....	.....
Australia.....	.....	.....	June 1921	12,738,852	June 1914	11,483,882	1,227,185	.....	.....	.....
New Zealand.....	.....	.....	June 1920	3,101,945	April 1911	2,020,171	1,092,571	.....	.....	.....
South Africa.....	.....	.....	.....	5,075,488	Dec. 1913	5,796,949	177,853	.....	.....	.....
Tunis.....	.....	.....	.....	634,823	Dec. 1913	637,304	417,519	.....	.....	.....
Egypt.....	.....	.....	.....	505,150	Dec. 1913	5,339,967	1,978,690	.....	.....	.....
Madagascar.....	.....	.....	.....	6,588,064	Dec. 1913	114,191,188	.....	.....	.....	.....
Totals, increase.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....
.....
.....
Increase for all countries.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Russia in Europe (excluding Poland).....	1919-20	117,428,365	.....	1916	38,373,000	1914	32,704,000	125,042,000	.....	.....
India.....	.....	.....	.....	.....	.....	1913-14	125,042,000	125,042,000	.....	.....

(a) Includes young buffaloes.

(b) Includes figures for latest date where 1921 or 1920 figures are not available.

THE AGRICULTURAL GAZETTE OF CANADA

Countries	Recent estimates			Before the war			Difference between pre-war and recent estimates
	Date	Number	Date	Number	Date	Number	
Great Britain.....	June 1921	20,452,536	June 1920	19,743,628	June 1914	24,363,396	3,910,860
Ireland.....	June 1921	3,708,290	June 1920	3,585,598	June 1914	3,600,581	107,709
France.....	Dec. 1920	9,372,630	Dec. 1919	8,900,990	Dec. 1913	16,131,390	6,758,760
Alsace-Lorraine.....	Dec. 1920	33,511	Dec. 1919	31,087	Dec. 1913	14,444,000	10,480
Italy.....	Dec. 1920	19,337,427	April 1918	11,753,910	Dec. 1913	13,824,000	2,070,090
Spain.....	Dec. 1919	17,734,922	Dec. 1919	17,734,813	Dec. 1913	16,441,407	2,896,020
Norway.....	Dec. 1919	1,326,813	June 1918	1,563,654	Sept. 1914	1,326,850	142,037
Sweden.....	July 1921	522,000	June 1919	504,241	July 1914	514,918	7,082
Denmark.....	.....	126,202	July 1919	437,075	June 1913	842,018	404,943
Netherlands.....	.....	240,553	Mar. 1919	112,112	Dec. 1910	185,373	59,171
Belgium.....	April 1920	3,850,733	April 1919	265,413	April 1911	161,414	79,139
Switzerland.....	Mar. 1920	866,060	.....	.....	Oct. 1906	3,022,988	777,745
Portugal.....	Dec. 1920	6,139,300	Dec. 1919	5,340,527	Dec. 1920	1,158,466	292,406
Czechoslovakia.....	Dec. 1920	934,084	.....	.....	Dec. 1913	5,476,837	662,463
Germany.....	.....	80,522,778	.....	.....	.....	996,000	61,916
Latvia.....	.....	8,589,254 or 9.6%	.....	.....	.....	.....	.....
Totals.	.....	.....	.....	.....	.....	89,112,032	.....
Decrease.....	.....	.....	.....	.....	.....	.....	.....
Canada.....	June 1921	3,675,860	June 1920	3,720,783	June 1914	3,434,261	241,599
United States.....	Jan. 1922	36,045,000	Jan. 1921	37,452,000	Jan. 1914	49,719,000	13,671,000
Argentina.....	.....	.....	June 1916	45,309,419	June 1914	43,225,452	2,083,967
Australia.....	.....	.....	Dec. 1919	75,554,082	Dec. 1913	85,057,402	9,503,320
New Zealand.....	April 1921	23,236,328	April 1920	23,919,970	April 1914	24,798,763	1,562,436
South Africa.....	April 1920	26,288,960	Feb. 1919	28,491,500	Dec. 1913	35,711,000	9,422,040
Tunis.....	.....	833,542	.....	2,661,579	.....	1,933,039	.....
Egypt.....	.....	300,000	.....	838,107	.....	816,000	7,542
Madagascar.....	1920	.....	.....	.....	1916	308,751	8,751
Totals.	.....	213,897,770	.....	.....	.....	243,799,169	.....
Decrease.....	.....	29,901,399 or 12.3%	.....	.....	.....	.....	.....
Decrease for all countries.....	.....	38,490,653 or 11.6%	.....	.....	.....	37,240,000	.....
Russia in Europe (excluding Poland).....	1919-20	21,983,573	1916	63,833,000	1914	23,092,212	.....
India.....	.....	.....	.....	.....	.....	.....	.....

THE AGRICULTURAL GAZETTE OF CANADA

SWINE

Countries	Recent estimates				Before the war				Difference between pre-war and recent estimates	
	Date	Number	Date	Number	Date	Number	Date	Number	Increase	Decrease
Great Britain.....	June 1921	2,650,559	June 1920	2,122,459	June 1914	2,646,977	June 1914	3,582	328,469	.....
Ireland.....	June 1921	977,169	June 1920	982,418	June 1914	1,305,638	Dec. 1913	.....	2,450,570	.....
France.....	Dec. 1920	4,585,280	Dec. 1919	4,080,560	Dec. 1913	7,355,850	Dec. 1913	.....	134,521	.....
Alsace-Lorraine.....	Dec. 1920	358,479	Dec. 1919	308,900	Dec. 1913	493,000	Dec. 1913	.....	383,674	.....
Italy.....	Dec. 1920	4,228,964	April 1918	2,338,926	Dec. 1914	2,722,000	Dec. 1913	.....	2,710,185	1,518,779
Spain.....	Dec. 1920	4,228,964	Dec. 1919	4,106,791	Dec. 1914	2,722,000	Dec. 1913	.....	228,117	18,831
Norway.....	.....	.....	June 1918	209,286	Dec. 1914	977,612	Dec. 1913	.....	260,829	.....
Sweden.....	July 1921	1,430,000	June 1919	716,733	July 1914	1,007,861	July 1914	1,066,706	1,496,706	.....
Denmark.....	.....	.....	July 1920	449,829	June 1913	1,350,204	Dec. 1913	.....	900,375	.....
Netherlands.....	.....	.....	Mar. 1919	720,205	Dec. 1913	1,412,293	Dec. 1913	.....	435,650	.....
Belgium.....	.....	.....	April 1919	465,306	April 1911	570,226	Oct. 1906	.....	24,104	.....
Switzerland.....	.....	.....	April 1919	921,312	Oct. 1906	1,110,957	Dec. 1913	.....	189,645	.....
Portugal.....	.....	.....	Dec. 1919	14,149,402	Dec. 1919	10,517,875	Dec. 1910	.....	11,106,538	.....
Germany.....	.....	.....	Dec. 1920	1,956,405	Dec. 1910	2,415,532	Dec. 1913	.....	149,127	.....
Czecho-Slovakia.....	.....	.....	Dec. 1920	457,032	Dec. 1913	557,000	Dec. 1913	.....	99,948	.....
Latvia.....	.....	.....	.....	.....	.....	53,198,297	.....	.....	.....	.....
Totals.....	.....	36,952,271	.....	.....	.....	.....	.....	.....	.....	.....
Decrease.....	.....	16,246,026 or 30.5 %	.....	.....	.....	.....	.....	.....	.....	.....
Canada.....	June 1921	3,904,895	June 1920	3,516,678	June 1914	3,434,261	June 1914	470,634	1,937,000	.....
United States.....	Jan. 1922	36,996,000	Jan. 1921	56,097,000	Jan. 1914	58,933,000	Jan. 1914	.....	326,761	.....
Argentina.....	.....	.....	June 1916	3,227,346	June 1914	2,900,585	Dec. 1913	.....	104,537	.....
Australia.....	.....	.....	Dec. 1919	695,968	Dec. 1911	800,505	Dec. 1911	.....	6,527	.....
New Zealand.....	.....	.....	Jan. 1920	266,829	April 1911	348,754	Dec. 1911	.....	521,445	.....
South Africa.....	.....	.....	Jan. 1919	724,007	Dec. 1911	1,081,600	Dec. 1913	.....	17,400	.....
Tunis.....	.....	.....	Feb. 1919	11,681	Dec. 1913	17,400	Dec. 1913	.....	281	.....
Egypt.....	.....	.....	Feb. 1919	21,331	Dec. 1915	7,700	Dec. 1915	.....	14,230	.....
Madagascar.....	.....	.....	.....	.....	Dec. 1916	543,585	Dec. 1916	.....	456,415	.....
Totals.....	.....	66,765,492	.....	.....	.....	.....	.....	68,066,690	.....	.....
Decrease.....	.....	21,220 or 1.9 %	1,000,000	.....	.....	.....	.....	.....	.....	.....
Russia in Europe (excluding Poland).....	.....	1,301,198 or 14.5 %	1,547,224	1916	16,603,000	1914	11,581,000	11,581,000	.....	.....

In the above tables are given the numbers of cattle, sheep and swine in all the countries for which recent figures are available. There were large decreases in many countries during the war, and in order to show to what extent recoveries have been made, figures are given for 1914 or the year nearest 1914 for which estimates are published. These may be compared with the most recent figures. In the first column the figures for the latest available date are presented. A second column giving the figures for an immediately preceding year is given, in order to show the present trend of the numbers of live stock.

The countries of Europe are given separately from those outside of Europe, and the figures for Russia and India have been placed apart at the end of the tables. The latest estimates for Russia were made in 1916. Since that date the live stock population of that country must have greatly decreased. The estimates for India have been placed separately because that country does not enter into the world's meat trade. The large numbers of cattle in India are used almost entirely as draught animals and beasts of burden.

A feature in the live stock statistical situation is the large decrease in the estimates for sheep and swine in the United States. In that country the figures for the last three

years have been revised in accordance with the 1919 census. This revision shows little change in the number of cattle, but shows decreases from previous estimates of about 10,000,000 in sheep and in swine. The numbers of sheep and swine in the United States have decreased since 1914.

Cattle.—In the countries included in the table the total number of cattle has increased by 12,000,000 or over 6 per cent since before the war. There is a decrease of 7,000,000 in Europe, the bulk of this being in Germany. In the countries outside of Europe, the United States and Canada show large increases since before the war.

Sheep.—The total number of sheep shows a decrease of 38,000,000, or 12 per cent since the pre-war period. This is largely accounted for by large decreases in Australia and South Africa, and the decrease of 13,000,000 in the United States as established by the revised census estimates. The numbers of sheep in Canada and the United States decreased during the past year.

Swine.—There is a total decrease of 17,500,000 or 14.5 per cent in swine since before the war. Germany and France show the largest decreases. There is a large increase in Spain. Germany is regaining her swine population, as there was an increase of nearly 4,000,000 between 1919 and 1920.

THE WORLD'S SITUATION JUSTIFIES THE PRESENT IMPROVEMENT IN PRICES.

In an article prepared in this Branch in the middle of November last and published early in December, many encouraging factors were presented to justify higher wheat prices than then prevailed. As foreshadowed in that article the United States figures for the past three years, since published, had underestimated the United States wheat crop, and this explained the otherwise unaccountable exports from that country. The exchange situation in Europe and the low prices have favoured and as a matter of fact actually stimulated unusually large imports. Recent events, in part disclosed in the preceding notes, now emphasize the general correctness of that analysis of the situation. The exports to Europe have since been and continue to be unusually large. The ocean floating supply has been comparatively small and the importing world's stocks also small. There has been a toning down of the earlier optimistic reports on the new crops and old supplies in the Southern Hemisphere. Serious damage has overtaken winter wheat in the American southwest. Weather conditions have been decidedly unfavourable in Germany, where imports during the first three months of the new crop year were at the rate

of 10 million bushels per month. Rapidly falling prices throughout the world last autumn had the inevitable effect of curtailing the European acreage sown to winter wheat. In fact, the whole trend of demand and supply is the reverse of what existed during the month of November last.

We have once more carefully reviewed the import and export probabilities for the grain year which will end on August 1st next. Without giving detailed tables, suffice it to say that according to our calculations the import demand is for quantities running between 650 and 680 million bushels, while the probabilities of export within the grain year are from 640 to 660 million bushels. The exports of these quantities would leave home surplus stocks reduced by nearly one-half of what they were on August 1st last.

The strength of wheat is somewhat reflected in other cereals and live stock must eventually follow the trend. Lambs and hogs have been leading the way for a fair recovery, and to what extent this result is justified by basic conditions is shown in the world's data for sheep and hogs presented in the preceding article.

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